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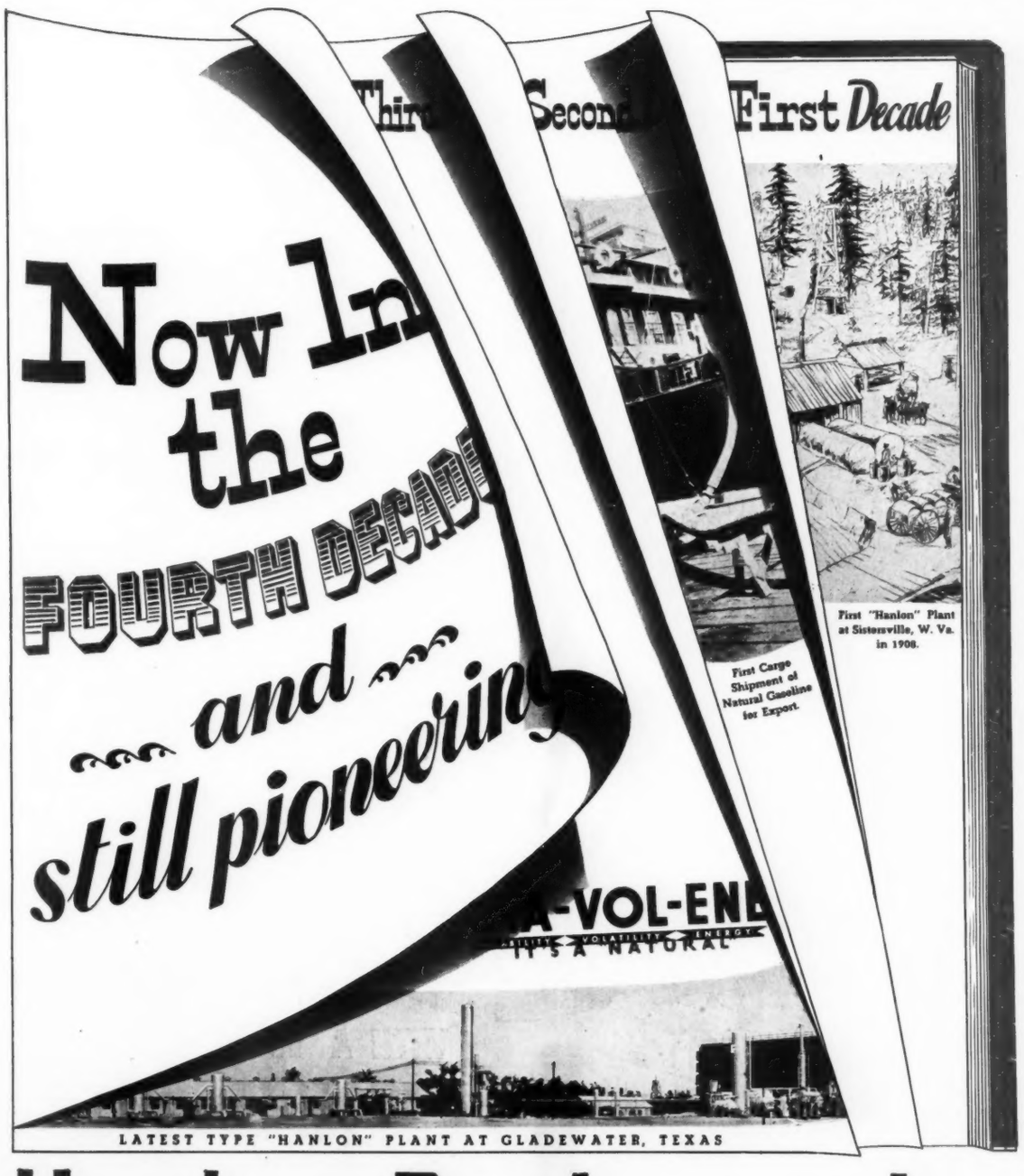

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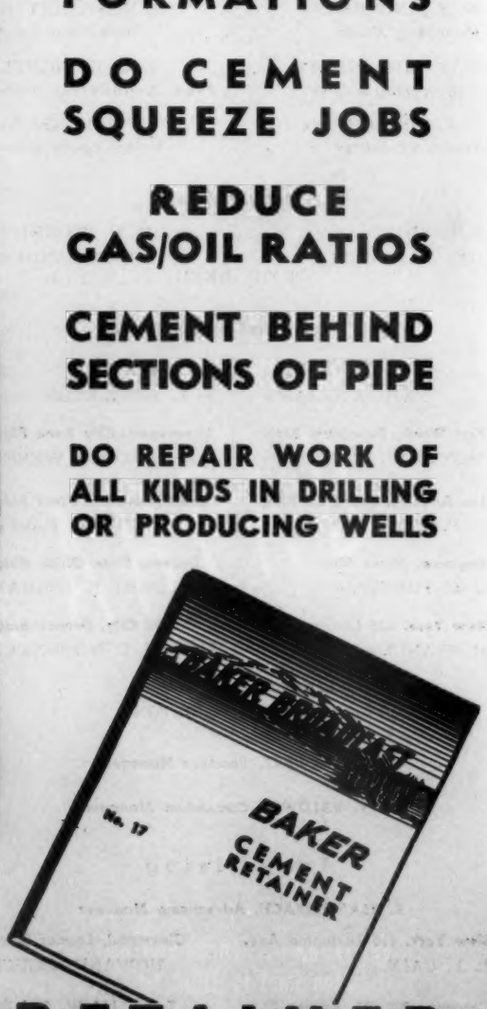

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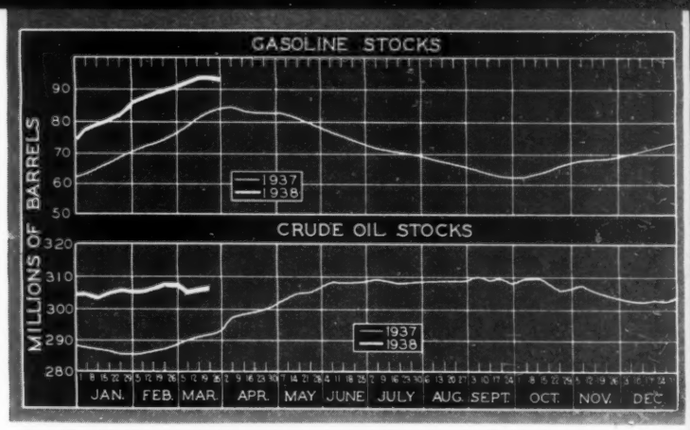


Need Less Production in April

THE oil business continued to maintain a firm front in most of its markets through the past week. The greatest improvement over the past three weeks has been in the refining division. Plant owners, after a long period of excessive operations, have at last reduced their runs to stills to the point where the weekly A.P.I. reports indicate that large increases in gasoline and fuel oil storage have ended.

CRUDE PRODUCTION *3,405,619 barrels daily average—down 23,953 barrels.*

CRUDE STOCKS *306,380,000 barrels as of March 19—up 814,000 barrels.*

GASOLINE STOCKS *92,858,000 barrels as of March 26—down 334,000 barrels.*

REFINERY RUNS *3,080,000 barrels daily week ending March 26—unchanged.*

Market students are pointing out that if refiners as a unit will continue in April the operating levels in effect the latter part of March, the industry will start pulling on the gasoline inventories, which now total in excess of 93,000,000 barrels. Some slow-up in the demand for gasoline is expected over the next week due to the fact that the recent heavy shipments ended the first of the week when the higher freight rates became effective. This lull in movement will be temporary, it is believed, because the seasonal gain in actual gasoline consumption is now under way. Normally April domestic gasoline consumption is from 7 to 11 per cent greater than in March, and this yearly development is reflected in larger shipments from refineries. Indications point to an average gain in April gasoline consumption this year, with the export outlook satisfactory.

The reduction in refinery operations has had the expected reflection in crude production statistics. For the two weeks ending March 19 the Bureau of Mines reports additions to crude oil storage were at the rate of 135,000 barrels daily. This follows a long period during which there were only minor gains in crude inventories due to the fact that refiners were taking the crude and running large quantities of the finished products to their storage tanks.

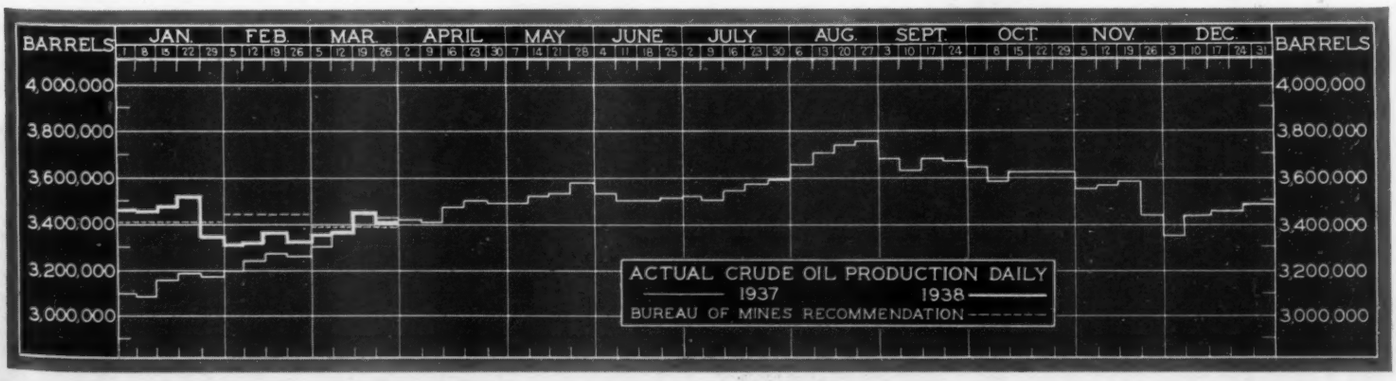
With this situation in mind those in touch with conditions contend that domestic crude oil production should be kept from 50,000 to 100,000 barrels daily under the March average. This will permit refiners to continue their daily average runs to stills around 3,100,000 barrels daily. Expansion in both crude oil and refinery operations probably will be justified by May 1.

The steady completion of gusher wells in the Wilmington field is the immediate problem on the West Coast where approximately 30 per cent of the current output is going to storage in the form of either crude oil or finished products. In the East several buyers of Pennsylvania crude will reduce purchases in April. Substantial reductions in price schedules in recent months have failed to reduce production in line with current requirements in that area.

Daily Average Production for Week

	Mar. 26 1938	Bur. Mines Mar. est.	Mar. state allowables	Mar. 19 1938
Oklahoma City	109,450	.....	.....	125,100
Fitts	60,750	.....	.....	60,825
Remainder of state	334,625	.....	.....	333,100
Total Oklahoma	504,825	547,700	475,000	519,025
East Texas	429,165	.....	.....	428,450
West Texas	188,947	.....	.....	187,298
North Central Texas	99,739	.....	.....	97,650
Texas Panhandle	72,271	.....	.....	72,900
East Central Texas	99,295	.....	.....	98,649
Gulf Coast Texas	322,320	.....	.....	322,902
Southwest Texas	105,686	.....	.....	104,900
Total Texas	1,317,423	1,344,900	1,300,506	1,312,749
North Louisiana	77,120	.....	.....	78,170
Gulf Coast Louisiana	183,580	.....	.....	182,250
Total Louisiana	260,700	239,400	246,755	260,420
California	727,500	694,600	694,600	757,250
Kansas	178,750	176,700	169,528	172,050
Arkansas	52,020	38,200	.....	49,130
Eastern fields	140,700	129,200	.....	138,100
Michigan	52,141	51,600	.....	52,963
New Mexico	105,030	105,100	105,100	104,980
Rocky Mountain area	66,530	64,200	.....	62,900
Total United States	3,405,619	3,391,600	.....	3,429,572

Decrease, 23,953 bbls. daily.



Cracking, Poly Natural Gaso Combined in

SHAMROCK Oil & Gas Corp. during the past year placed in operation a revolutionary type plant near Dumas, Tex., in which polymerization, cracking and natural gasoline manufacturing are combined. The equipment accomplishing each of the three operations comprise a separate unit, but all are located on the same site and the products or by-products from one unit are further processed in the others.

Before constructing the polymerization and cracking units and revamping its existing natural gasoline plant, the company felt that the combination of the three processes was commercially feasible due to the following reasons: First, gasoline manufactured from the company's crude sources was fairly low in octane rating, thus the gasoline obtained from a polymerization unit could be used to increase the market value of its motor fuel.

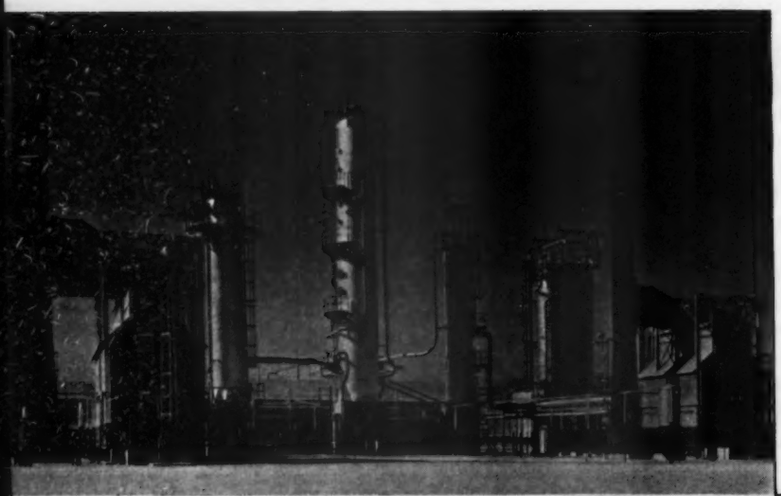
Second, the Panhandle gas processed in its natural gasoline plant contained a relatively high volume of propane and butanes compared with the pentanes and heaviers present. At that time the lighter fractions were not being recovered. Through the proposal to revamp the natural gasoline plant it became apparent that a greater recovery of natural gasoline could be obtained, in addition to supplying the polymerization plant with a charging material of practically pure butane.

Third, its refinery at Sunray, a few miles from Dumas, was obsolete and inefficient in operation. Thus, if a new cracking unit were added at Dumas, the company would be able to increase its refinery efficiency. Also, the recovery from the polymerization unit would be increased since a pyrolytic polymer obtained in the poly plant could be further processed in the cracking unit.

The polymerization unit, of the catalytic type licensed by Universal Oil Products Co., was built and placed in operation in March, 1937. The plant is the first commercial plant of this type for converting butanes from natural gasoline plants into polymer gasolines, and was constructed by Stearns-Roger Manufacturing Co. and Parkhill-Wade. The cracking unit was placed in operation shortly thereafter. The latter is of 2,000 bbls. crude capacity.

Also involved in the construction work was the revamping of absorption facilities for increasing the gasoline plant's oil-circulating capacity and installation of Clark compressors for compressing vent and cracked gases.

Arrangement of the two updraft type heaters and towers in the Dubbs cracking unit installed at Dumas



Below, interior of engine room showing the five angle-type compressors

Steps in Polymerization Process

Steps involved in the Universal Oil Products polymerization process may be briefly described as; first a breaking down into unsaturates of the butanes, and to some extent the propanes, by subjecting them to heat and pressure. The light unsaturated compounds formed are then caused to recombine, by use of heat in the presence of a catalyst, to form heavier saturated hydrocarbons having a boiling range like that of gasoline.

The butanes belong to the saturated or paraffinic series of hydrocarbons and are very inert chemically. As yet, no direct method has been discovered for making these light saturates combine to form heavier hydrocarbons. Therefore, they must first be broken down or converted into unsaturates (ethylene, propene, butenes, etc.), which are relatively active chemically and can be made to combine with each other to form various heavier polymers.

By D. H.

The initial breaking down or dehydrogenation step is accomplished in a butane cracking furnace. Here some 50 per cent of the pure butane charge is converted to unsaturates on a once-through operation so that there is some recycling of the unconverted butanes. The vapors from the cracker, after passing through condensers, a demethanizing column and a debutanizing column, are then heated to the proper temperature and charged to catalyst towers. The towers are packed with a solid granular phosphoric-acid catalyst of a definite size and shape. The product from the towers is then fractionated to obtain a finished catalytic polymer gasoline. The overhead from the final stabilizer, consisting mostly of unconverted butanes, some propane and about 6 per cent unsaturates, is taken back to the butane cracker and the process is repeated.

In addition to the final catalytic polymer a pyrolytic polymer is also obtained, being removed from the process at the base of the debutanizer. This product has a relatively high gum content, but its high octane number more than offsets this detriment. It is therefore removed from the system and placed in the Dubbs cracking unit system for further refining.

A recovery of 26 to 28 per cent of the charge is obtained as a finished catalytic polymer and some 3 to 5 per cent of pyrolytic polymer. Typical distillation tests and other properties of these two

Shamrock Oil & Gas Corp.'s McKee plant near units are shown at the left, and th

merization and line Recovery Single Plant

polymers are shown in Tables 1 and 2. Process flow through the polymerization unit is shown in the accompanying flow diagram, and in general is as follows:

Fractionated butane from the final stabilizer of the natural gasoline plant is passed through caustic wash tanks, to remove the reactive sulfur compounds present, and run to a work tank. A pressure of about 55 pounds is held on the tank to reduce evaporation losses. The butane is then picked up by the feed pump and charged to the butane cracking unit. Approximately 2,100 bbls. of combined feed, of which some 1,100 bbls. is fresh butane, is charged daily to the unit.

The raw feed is charged to the butane cracking furnace at a pressure of about 700 pounds. The heater is a conventional Dubbs updraft, center-wall, bottom-fired unit revamped to provide sufficient soaking time to allow about 50 per cent of the charge to be converted into unsaturated compounds. The charge to the heater passes first through a convection bank, down through a radiant heating section, and then over to the outlet side of the furnace where the soaking section is placed. The number of tubes used and their specifications are as follows:

H. Stormont

28—3½"x2¾"x30'—Carbon moly in convection section.
28—3½"x2¾"x30'—2 per cent chrome moly in heating section.
10—3½"x2¾"x30'—D.M. calorized in heating section.
52—5"x4"x30'—D.M. calorized in soaking section.

Flow of Cracked Butane Vapors

The material leaves the furnace, in vapor form, and is transferred at a temperature of about 1,050° F. and 550 pounds pressure to reboiler exchangers. Here the vapors are heat exchanged against materials from the bases of the debutanizer and stabilizer in order to supply heat for the operation of the two towers. The stream from the debutanizer column is passed through five G-fin type horizontal exchangers and the stream from the stabilizer through two exchangers; these two streams passing through the shell of the reboiler and the vapors from the butane cracker through the horizontal tubes. From the reboiler the vapors pass through condensers to a receiver.

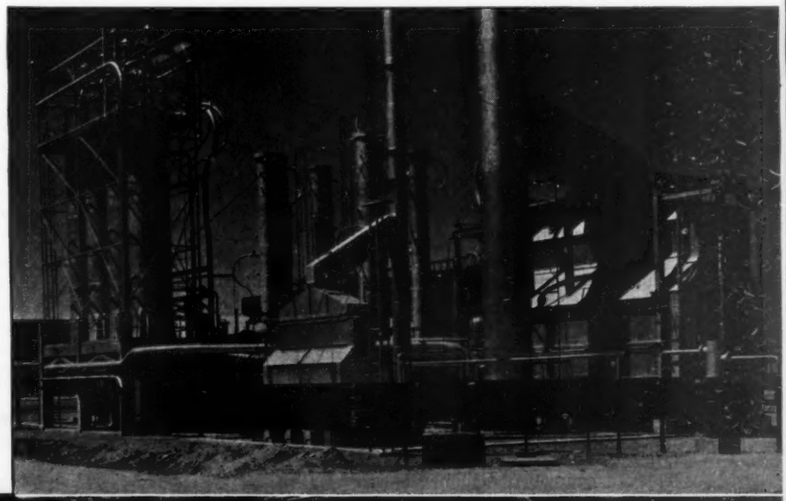
To prevent the reboiler oils from the two towers from being heated too high, a split stream is taken from the base of the receiver and this is pumped back into the vapor lines leading to the two banks of reboiler exchangers. The amount of quench that is pumped into the two banks is regulated by automatic valves actuated by thermostats on the two towers. In operation, if the temperature at the base of debutanizer should tend to become too high, the thermostat would cause the control valve to open and allow more liquid to be introduced into the hot vapors going to the debutanizer reboiler. The amount of heat that is transferred from the hot vapors to the reboiler oil is lessened and thus the tower base temperature is lowered. Similarly, if the temperature in the debutanizer tends to go too low, the operation is reversed and less quench is used. The temperature at the base of the stabilizer is controlled in a like manner.

From the receiver the material passes through a pressure controller, regulated to maintain a back pressure of 500 pounds, into an 18-plate demethanizer column operated at a pressure of 300 pounds. A base temperature of 190° F. is obtained through use of an external vertical-tube reboiler which is heated by steam. The charge enters the column on the sixth plate from the bottom and vapors ascending the column are scrubbed by the pyrolytic polymer taken from the base of the debutanizer. A temperature of approximately 95° F. is held on the tower top. The tower is equipped with a pressure controller which regulates the amount of gas vented from the tower; a liquid-level controller in the base of the tower for regulating the height of the liquid in the tower; and a temperature controller for controlling the volume of steam passing through the reboiler. Practically all the methane and part of the ethane and ethylene are taken overhead in this column, the remaining heavier materials being drawn from the base of the tower and transferred to the debutanizer.

The charge to the debutanizer enters the column on the tenth tray from the bottom, and the tower is operated so that overhead materials may be charged to the catalyst towers. A tower-top temperature of approximately 200° F. is maintained through a conventional reflux circuit.

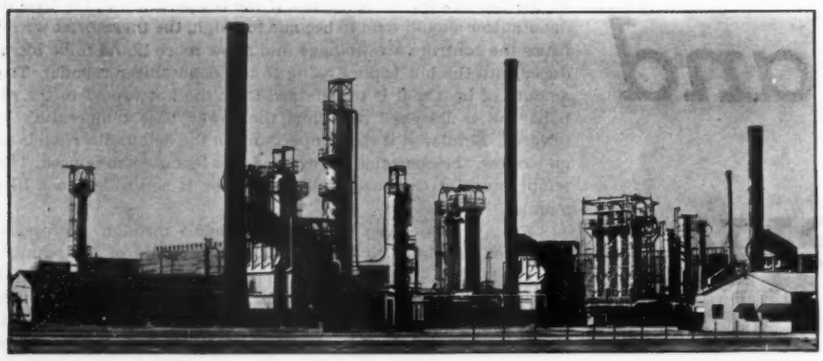
Another stream entering the debutanizer is that made up of compressed cracked gases and the butane obtain in the debutanizing column of the oil

Catalytic type polymerization unit operated on fractionated butane from the nearby natural gasoline plant



Below, motor-driven pumping equipment for the 2,000-bbl. cracking unit

Dumas, Tex. The cracking and polymerization e natural gasoline plant on the right



View showing compactness of the cracking unit (at left) and polymerization unit

cracking unit. This material is caustic washed and transferred to the debutanizer where it enters the tower through the reflux receiver.

TABLE 1—CATALYTIC POLYMER GASOLINE
A.S.T.M. distillation, degrees F.

Initial boiling point	85
10 per cent point	140
20 per cent point	174
30 per cent point	190
40 per cent point	210
50 per cent point	228
60 per cent point	254
70 per cent point	288
80 per cent point	316
90 per cent point	400
Endpoint	446
Gravity, degrees A.P.I.	66 1
Reid vapor pressure, lbs.	10 8
Octane number (C.F.R. method)	87
Octane blending value	100–119
Sulfur, per cent	.009

TABLE 2—PYROLYTIC POLYMER GASOLINE
A.S.T.M. distillation, degrees F.

Initial boiling point	117
10 per cent point	146
20 per cent point	159
50 per cent point	203
90 per cent point	410
Endpoint	517
Gravity, degrees A.P.I.	49 2
Reid vapor pressure, lbs.	4 8
Octane number (C.F.R. method)	75
Sulfur, per cent	0 20

A pressure of approximately 265 pounds is maintained on the tower. A base temperature of 450° F. is obtained by recirculating liquid from the bottom of the column through the reboiler exchanger (as has been described) and back into the bottom of the column. The pyrolytic polymer removed from the base of the column is split into two streams, one of which goes to storage, from where it is charged into the Dubbs cracking unit. The other stream is cooled to about 55° F. and then is picked up by a small pump and recirculated to the demethanizer as absorption oil. Only the amount required for scrubbing the light gases is recirculated to the demethanizer, the remainder being passed to storage by means of suitable by-passes and flow controllers. The overhead gases, which analyses show to be approximately 27 per cent propene and butenes, are then transferred to the catalytic system.

The first step in the processing of these vapors consists of heating them in a small furnace to a controlled temperature of about 400° F. In order to keep the catalyst moist, a controlled amount of preheated water or steam is injected into the vapors before they enter the heater. The heated vapors from the furnace are then transferred to the four "cat" towers which are operated at about 250 pounds pressure. The towers are arranged so that the vapors pass downward through either two or three of them in series, the other one or two being temporarily removed from the system for regeneration. Water is added to the outlet header of the last tower in order to reduce the corrosive action of the catalyst, and to partially cool the catalytic polymer.

From the catalyst towers the vapors pass through a water separator and through a condenser into a distillate receiver operated at 200 pounds pressure. A temperature of about 180° F. is maintained in the receiver through by-passing some of the vapors around the condenser. The condensate then flows from the receiver to a stabilizing column where materials too light to remain in the finished gasoline are taken overhead and returned to the butane work tank for recycling through the entire process. The tower is refluxed in a conventional manner by the light overhead fraction to maintain a tower-top temperature of approximately 130° F. Reboiler heat required for the operation of the stabilizer is secured by recirculating liquid from the base of the tower back through the reboiler exchangers, as has been explained. The tower is operated at about 110 pounds pressure with a base temperature of about 250° F. The finished catalytic polymer gasoline is removed from the tower by an automatic liquid-level controller, cooled and run to storage. Approximately 26 per cent of the fresh butane charge stock is recovered as a finished gasoline, properties of which are shown in Table 1.

Since a carbonaceous deposit gradually accumulates on the catalyst and reduces its activity, the towers must be reactivated periodically. This is done about every 500 hours. Piping and valves on each of the four towers are arranged so that each tower in turn can be used for the admission of fresh vapors. In this way operation of the towers can be rotated so that the tower containing the least active catalyst can be taken out of service when a reactivated tower is again placed in operation.

Removal of the carbonaceous deposit is accomplished by burning with heated flue gases and a controlled volume of air. The flue gas is prepared by burning gas in the presence of excess air, in order that relatively pure CO_2 may be obtained. The combustion products are then scrubbed and passed to a heater where the flue gas is heated to a temperature of approximately 850° F. The gas and a controlled volume of air is then released into the tower to be regenerated. As the burning progresses the amount of air in the flue gas is reduced since the burning of the carbonaceous material releases additional heat. A temperature of about 900° F. is maintained during the regenerating process, which requires from two to three weeks. After burning, a steam treatment is used to rehydrate the catalyst which would be inactive otherwise.

Natural Gasoline Unit

The natural gasoline plant is operated as a well pressure plant, at present processing a total of 210,000,000 cubic feet daily taken from approximately 60 wells within 10 miles of the plant. The gas is typical Panhandle dry gas, an analysis of which is as follows:

	Volume %
Methane	91.21
Ethane	3.56
Propane	3.21
n-Butane	.96
Iso-Butane	.46
n-Pentane	.21
Iso-pentane	.20
Hexane and heavier	.18

Since the natural gasoline plant had been operating as a well-pressure plant it was necessary to install recompressors to increase the recovery of butane and for compressing the cracked refinery gases. To handle these gases five 300-hp., angle-type Clark compressors were installed, the units taking the vent and cracked gases at 35 pounds gauge and compressing them to 235 pounds. Each unit was designed to handle 2,700,000 cubic feet of gas daily. The plant's oil-circulating capacity was also increased in order to obtain higher extraction of the light fractions in the gas.

The plant is operated to obtain a maximum of the butane cut so that a relatively high absorption oil ratio is maintained. When operating to produce 26-pound natural gasoline, a ratio of 9 gallons per 1,000 cubic feet of gas is used, but a somewhat lower ratio is used when a lower vapor pressure gasoline is being made. Regardless of the grade of gasoline being made, operation of the natural gasoline plant as a whole is regulated so as to give 1,100 to 1,200 bbls. of fractionated butane to be used as charging stock for the polymerization unit.

Flow of gas through the natural gasoline plant is conventional, incoming gas from the field being led directly to a battery of five 16-plate absorbers, operated at a pressure of 300 pounds. Residue gas from the absorbers is piped to several carbon black plants, located about 2 miles from the McKee plant, owned by Columbian Carbon Co., Continental Carbon Co., Reliance Carbon Co. and Crown Carbon Co.

Rich oil from the absorbers is passed through vent tanks, heat exchangers and preheaters to the stripper. The vapors from the stripper accumulate in a dewatering tank, from which they are pumped to a primary stabilizer. Vapors flashed from the unstabilized gasoline in the dewatering tank are run through the Clark compressors. The condensed vapors, which are rich in propane and butanes, then rejoin the gasoline stream going to the final stabilizer. Natural gasoline of the desired vapor pres-

For other valuable contributions on vital phases of modern refinery operation, turn to the 108-page Annual Refinery Engineering Section starting opposite page 72

sure is taken off the bottom of the primary stabilizer. The overhead vapors from this stabilizer are then run through a final fractionator where practically pure butane is removed.

A gasoline recovery of approximately .3 gallon per 1,000 cubic feet of gas processed is obtained in the first stabilizer, depending, of course, on the grade of natural being produced. The butane fraction recovered amounts to about .45 gallon per 1,000 cubic feet of gas. The fraction is approximately 98 per cent pure iso- and normal butane, the remaining 2 per cent being largely propane. Typical initial boiling points and endpoints approximate 18 and 38 degrees, respectively.

The 2,000-bbl. cracking unit is of conventional Dubbs design and consists essentially of two updraft heaters, a reaction chamber, a flash tower, fractionating tower and a debutanizer or gasoline stabilizing tower. Operation of the unit differs from the ordinary in that the pyrolytic polymer taken from the base of the debutanizer in the poly unit is charged into the cracked gasoline stream in the flash chamber. The stabilizer discard is charged to the polymerization unit for processing into a polymer gasoline, and also uncondensed cracked gases are compressed and charged to the unit, instead of being burned as fuel as in ordinary practice.

In normal operation of the unit either topped crude from the Shamrock refinery at Meldavis or fresh crude from Moore County, Texas, is charged to the unit. The crude charge is passed through an exchanger, heated by the overhead stream from the fractionating tower, where it is brought up to a temperature of about 300 degrees. It is then passed through a crude settler or desalting vessel from where it is charged to the fractionating tower. The unvaporized portion of the charge is withdrawn continuously from the base of the tower, picked up by the heavy oil pump and discharged to the heater at 500 pounds.

Flow through the heater is as follows: The charge enters the top through two parallel coils and continues divided, one-half passing down through the series of convection and radiant tubes on one side of the heater and the other half passing down through the tubes on the other side. The vapors are then reunited at the heater outlet, maintained at approximately 930° F., and transferred to the reaction chamber. A pressure controller at the base of the chamber maintains a back pressure of 225 pounds on the chamber. From here, in conventional manner, the stream enters the flash chamber which is operated at 70 pounds pressure, a tower-bottom temperature of 845° F. and a top temperature of 800° F. A 10-degree A.P.I. gravity fuel oil is taken off the bottom of the column and run to storage while the overhead vapors enter the fractionator.

The overhead from the fractionator is passed through the crude heat exchanger, through condensers and to a reflux receiver. The tower-top temperature is controlled by the usual reflux circuit, normally held about 400° F. A side stream is withdrawn from two trays near the top of the column, stripped, cooled and run to storage as 400 initial and 500 endpoint distillate. Light vapors stripped from the stream in the stripper are returned to the tower.

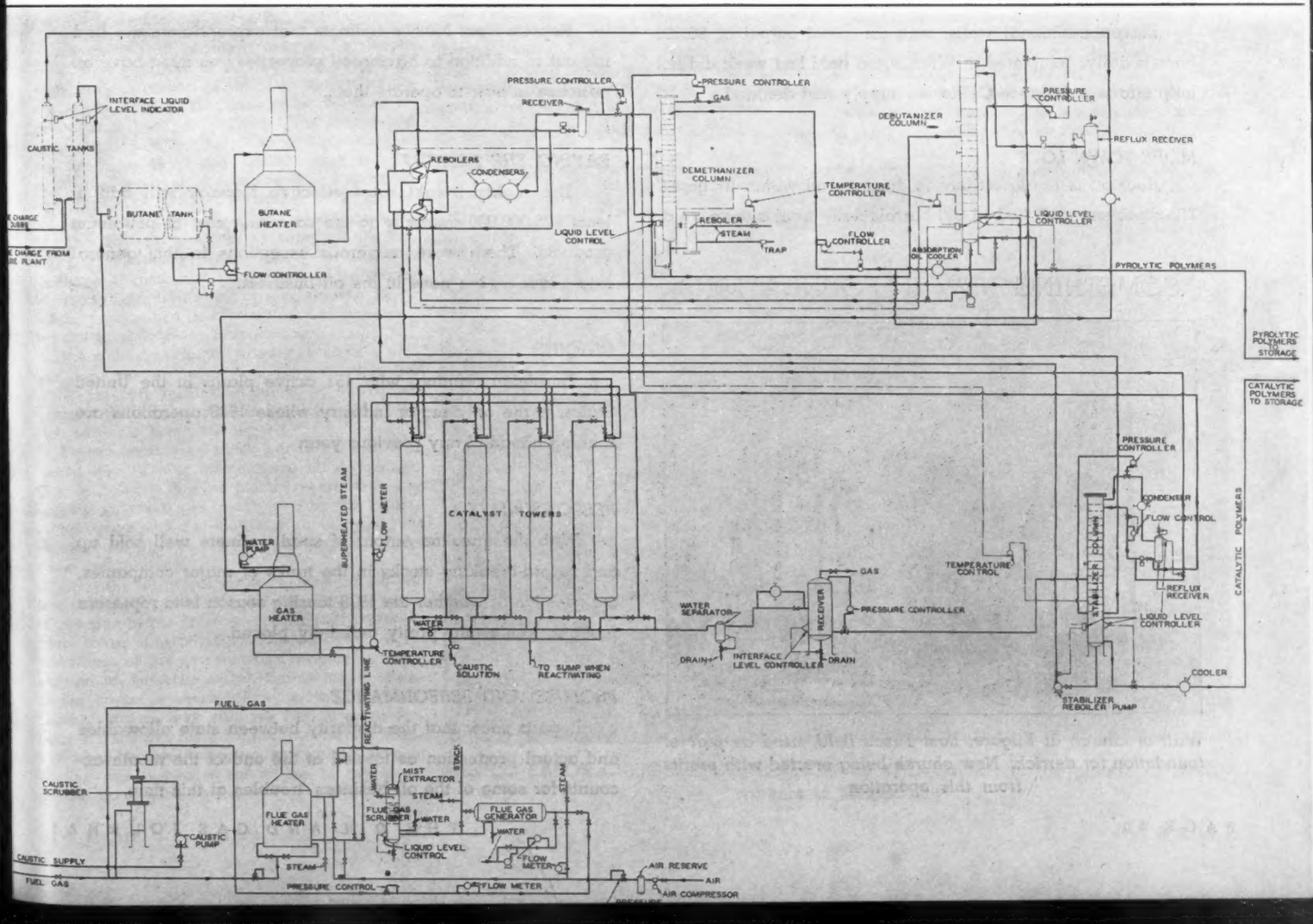
From the reflux receiver the unstabilized gasoline is transferred to a distillate receiver from where it is picked up by the stabilizer charge pump. Stabilized, butane-free gasoline is withdrawn from the base of the column and run to storage. The overhead vapors are cooled and run to a receiver from which the desired amount of reflux is pumped back over the tower. The remainder of the light fractions, containing a high percentage of butanes, is charged to the polymerization plant.

All towers, receivers, heat exchangers and other vessels in the three units of the plant are equipped with drop-out valves operated by remote controls. Thus it is possible to empty any tower or vessel in the plant if a pressure relief valve should fail to function. Lines from the tower and vessels empty into a 12-inch line which runs to a sump placed well away from the plant. The controls for opening the drop-out valves are placed in the plant yard at a considerable distance from any of the units. The valves are operated by steel cables wound around pulley wheels a sufficient number of revolutions to completely open the valve with one pull. The cables are then led, through conduits, to the centrally located control point.

Another safety feature of the plant is the extensive use of steam lines to smother flames in case of a fire. Provision is made for smothering the pump house with steam and lines are placed within reach of all towers.

Purchased electric power is used entirely in the plant, being delivered to the plant at 6,900 volts and stepped down to 2,300 volts and 440 volts before being led to the various points in the plant. The water supply is obtained from shallow wells. Process and operating steam is generated in four 550-hp. boilers, operated at a working pressure of 160 pounds. The office building, pump room, compressor building and all other buildings are air-conditioned due to occasional dust storms.

Simplified flow diagram of the catalytic-type polymerization unit of Shamrock Oil & Gas Corp.'s Dumas, Tex., plant



SPARKS FROM THE NEWS

CHANGING NAMES

A jig-saw puzzle expert would have a difficult time keeping up with Kansas oil pool names, so rapidly are they changed or consolidated.

DELAYED PLAY

After long neglect, the Sac and Fox pool in Oklahoma is getting a big play. It was opened nearly 12 years ago, but Seminole came along and stole the show.

STRIDES IN REFINING

If polymerization and hydrogenation continue to make the strides they have over the past year many modern refineries of the future will depend on gas lines as well as crude lines for their raw material.

COMPLICATIONS

Eleven additional wells, with an initial output of 30,000 barrels daily, completed in Wilmington field last week did not help efforts to balance California supply and demand.

MORE TOWN LOTS

Houston is the latest city to discover oil within its gates. The discovery well flowed 600 barrels daily from a deep sand.

SOMETHING NEW IN FOUNDATIONS

Wall of church at Kilgore, East Texas field, used as part of foundation for derrick. New church being erected with profits from this operation

GOOD ACCOUNT

With 30 completions last week, the Illinois Basin is one of the most active areas. The basin in the first year of its revival has given a good account of itself.

PROMISING

With the second well larger than the discovery test, owners of leases in the new Edenville field in Michigan appear to have something.

LIGHTER CARS

Almost without exception automobile manufacturers are reported to be ordering lighter parts for their 1939 model passenger cars. They seem to be stressing lighter weight engines which means gasolines of still higher antiknock.

REQUISITE

Reports from Mexico indicate that expropriators are finding out in addition to having oil properties you must have experience in how to operate them.

PAYING THE FREIGHT

The higher freight rates effective Monday will add at least $25,000,000 annually to the consumer cost of petroleum products. There were numerous exceptions in this general rate advance, but none in the oil business.

UNIQUE

Petroleum refining, with 451 active plants in the United States, is the only major industry whose 1938 operations are running ahead of any previous year.

RESPONSIBILITY

With the gasoline output of small refiners well sold up and record-breaking stocks in the tanks of major companies, the question of whether the 1938 touring season is to represent profit or loss seems pretty definitely placed.

PROMISE AND PERFORMANCE

Reports show that the disparity between state allowables and actual production as totaled at the end of the month accounts for some of the oil business' troubles at this time.

Diplomats Entering Mexican Dispute

By HENRY D. RALPH and H. STANLEY NORMAN
Washington New York

The action of the United States Treasury Department in terminating its agreement to purchase silver from Mexico as of April 1 is regarded in Washington as a retaliation against the expropriation of oil properties, although both the treasury and state departments refused to confirm or deny this interpretation. The treasury has been buying about 5,000,000 ounces of Mexican silver monthly, and termination of the program will be a severe blow to maintenance of Mexico's financial program. The silver buying agreement was conditional on Mexico's use of the exchange to stabilize its monetary system in a manner satisfactory to this government, and the recent fluctuations of the peso following expropriation of oil properties is believed to give the treasury a technical excuse for its action.

Secretary Morgenthau has stated that he did not mix silver with other matters and more recently declared that the oil crisis had no bearing on the silver program, but termination of silver purchases may be taken as a means used by the administration to let Mexico know that it does not view the oil seizure lightly.

Washington Conference

Secretary Hull Monday conferred at length with representatives of American oil companies with Mexican properties and later stated that the conference resulted in a general exchange of information but that no decision would be reached until the department has concluded its study of the extensive brief and exhibits filed by the companies last week. Those attending the conference were W. C. Teagle, chairman; W. S. Farish, president of Standard Oil Co. (New Jersey); Eugene Holman, president of Huasteca Oil Co., Standard subsidiary; Judge Frank Feruille, representing Standard of California; Judge James W. Reid, general counsel of Sinclair, and A. E. Watts, president of Penn-Mex Fuel Co., representing the Sinclair group of interests.

The state department Monday received a protest from the Products Tank Line Co. that 130 of its tankcars in Mexico cannot be moved because of government action. Secretary Hull said the matter is being studied.

The suspension of silver purchases was welcomed in offices of international oil companies. The action will deprive Mexico of revenue averaging $2,500,000 per month paid by the United States over a period of months with an extra purchase of 35,000,000 ounces at 45 cents per ounce made last January.

Until the oil properties were expropriated petroleum taxes provided 1 out of every 15 pesos of revenue to the Mexican government. Sales of silver to the United States provided an even larger percentage of the government's revenue and suspension of deliveries to the United States is expected to be a severe blow to the Cardenas regime. Mexico may still sell her silver in the open market, but the price declined rapidly Monday when American support was withdrawn and trading was suspended for a time in the metal on the London exchange.

In Mexico City, President Cardenas said the government would carry on without revenue from silver sales to the United States and called upon the people to continue their loyalty displayed in a demonstration approving his action.

There was no apparent stimulation imparted to the Gulf Coast spot petroleum export market as a result of Mexican conditions. Most of the companies exporting petroleum from Mexico, totaling about 23,000,000 bbls., or 63,000 bbls. daily during 1937, said they would replace these supplies from other sources. Lack of immediate effect on Gulf Coast conditions is partially due to the fact companies exporting from Mexico are large producers and refiners in other parts of the world and have a variety of sources upon which to draw.

Standard could probably replace its Mexican production with Venezuelan oil refined at Aruba and to a certain extent this procedure is open to Royal Dutch-Shell which controls Mexican Eagle Oil Co. It is believed probable that the Shell group would be compelled to seek at least a part of its Mexican petroleum replacements in directions other than Venezuela and the Dutch West Indies where it has one of the world's largest refineries at Curacao. In this event it would appear likely that the United States would be a logical source of filling the immediate needs for the Shell group's international marketing activities.

In the case of Consolidated Oil Corp., which controls Mexican Sinclair Petroleum Corp., the United States is the only other important producing country in which the company has a supply adequate to meet requirements.

Four tankers of diversified registry which reached Mexican ports at about the time the expropriation decree was issued left with ballast and were rerouted to the Dutch West Indies and to the Gulf Coast for loading. The Mexican government was anxious to load the tankers with expropriated oil, provided payment was made either at Tampico or Mexico City. Oil companies notified the prospective purchasers they would hold them responsible for any petroleum thus loaded.

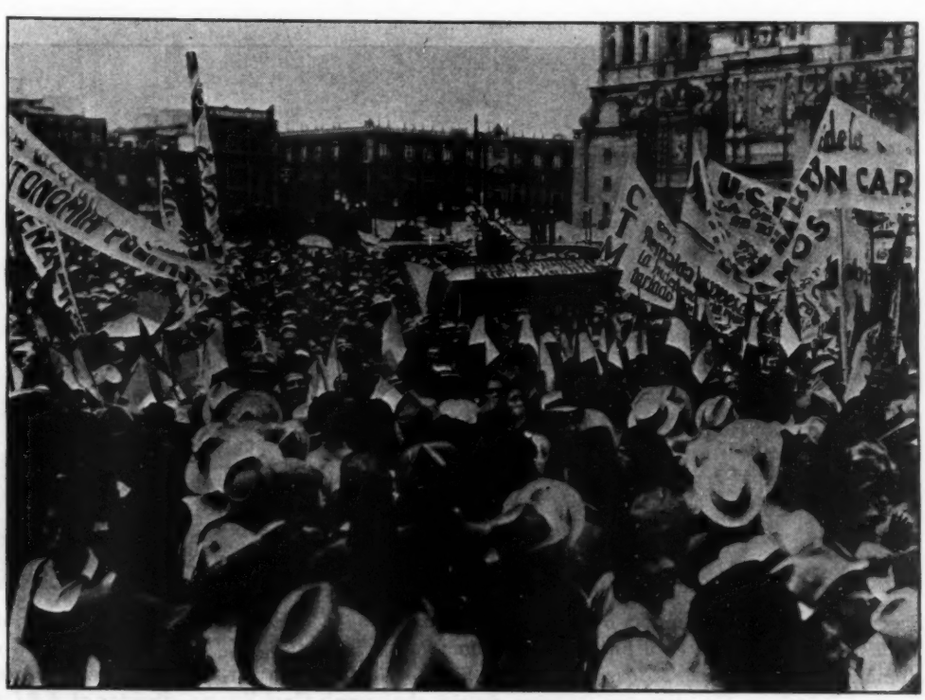
Interest of the Japanese government in negotiating for oil in Mexico, the basis for endless rumors of a pipe line project from Mexico City to the Pacific Coast, of long-term contracts and of tankers at or en route to Mexican ports, fanned the international issue to white heat.

In less than a week from the time private owners were divested of their Mexican oil holdings, petroleum shipments came to a stand-still, producing properties were curtailed by more than 50 per cent, workers were relieved of duty and a halt was called in all excepting the simplest refining processes.

Navy Interested

Unofficial reports were that the Navy Department became acutely interested in the petroleum situation of Mexico on learning that Japanese government tankers are either in or en route to Mexican ports for the purpose of taking on oil cargo. Another report said the Japanese government has a high official in personal contact with President Lazaro Cardenas discussing possible negotiation of a long-term contract. Still another rumor was that Japan was interested in financing extension of a 10-inch pipe line from the Poza Rica field from its present terminus in Mexico City to Acapulco on the Pacific Coast. Laying of approximately 200 miles of pipe line would be required to make delivery at Acapulco, a landlocked harbor. Facilitating the laying of such a line, however, is an existing highway

(Continued on Page 56)



MEXICO LABOR CHEERS EXPROPRIATION OF OIL—*Section of the parade of 250,000 workers in Mexico City*

Southwestern District of A.P.I. Discusses Practical Papers

By MITCHELL TUCKER

FORT WORTH, Tex., Mar. 26.—With a new record attendance, over 550 registrants, the Southwestern District of the A.P.I., Division of Production, held a very successful two-day session in Fort Worth on March 24-25.

W. S. Morris, director of the East Texas Engineering Association, Kilgore, was elected division chairman for the coming year, succeeding Arthur G. Levy who became chairman of the advisory committee.

Other division officers elected were as follows: E. P. Hubbard, Gulf Oil Corp., Houston (vice chairman for the Louisiana and Texas Gulf Coast); K. N. Sappington, Shell Petroleum Corp., Midland (vice chairman for West Texas); C. G. Staley, Lea County Proration Office, Hobbs (vice chairman for New Mexico); and W. E. Shoeneck, Ohio Oil Co., Shreveport (vice chairman for Arkansas and North Louisiana). Gordon Richmand, Hughes Tool Co., Houston, was reelected secretary and treasurer.

The first day session was devoted largely to administrative and executive matters, the technical sessions being held on Friday. Amon G. Carter of Fort Worth delivered the address of welcome, and was host at a buffet dinner and smoker at his lodge on Lake Worth. R. B. Kelly, division manager for Pure Oil Co., was chairman of the committee on arrangements.

In keeping with the Institute's program of cooperation with the state and federal program of vocational training and accident prevention, two papers were presented on these subjects. "Progress of Oil Industry Vocational Training in Texas," by J. R. Eddy, of the State Department of Education, Austin; and "Individual Training in Accident Prevention," by A. W. Breeland, Lone Star Gas System, Dallas.

H. M. Dow, lieutenant governor of New Mexico, addressed the session Thursday afternoon on "Administration of the Oil Industry in New Mexico," wherein he followed the history of proration and oil and gas laws from the discovery of the first oil in New Mexico in 1909 to the present time. He concluded forcefully:

New Mexico Goes Along

"To me, the most noteworthy and the most amazing thing is, that throughout the entire period, there has been no litigation whatever—not even a case filed in any court anywhere in New Mexico—challenging proration, or any order of the Conservation Commission or any provision of the New Mexico conservation statutes. . . The proration statute of 1929 and the conservation statute of 1935, and all legislative acts having to do with the Interstate Oil Compact, were enacted by New Mexico legislatures without debate, and without a single dissenting vote in any instance. This is evidence in abundance that New Mexico has 'gone along' with the oil industry."

The Institute's executive vice president, W. P. Boyd, Jr., of New York, followed with a comprehensive discussion on "What the Petroleum Industry Means to the Southwest." After pointing out such salient facts as that over one-half of the taxes collected in Texas come from petroleum, and that about two-thirds of the nation's oil reserves are in the Southwest, Mr. Boyd offered reassurance for the future in his concluding statement:

"Through the work of this district, and of other districts and chapters, petroleum engineers and technologists have demonstrated the value of transforming mutual interest into cooperative solution of pressing problems. I would like to suggest to you that the same mutuality of interest exists throughout the industry in the case of such pressing problems as winning the good will of the American public, assuring the enactment of constructive legislation, and promoting the development of fair and equitable taxation. Put into the solution of these problems the same inspiring, far-sighted, vigorous cooperative effort you have put into the solution of technical problems, and many of the ills of your industry will be cured."

The natural gas reserves in terms of years' supply in the United States, and particularly in the Southwest, far exceed the proven oil reserves, stated John S. Ivy, vice president of Union Producing Co., Houston, in his paper on "Growth and Importance of Natural Gas in the Southwest." He traced the development of gas transmission lines from the first wooden line laid in 1870 to the present main gas transmission lines totaling 54,886 miles, of which over one-half are located in or originate in the Southwest.

W. E. Schoeneck, Ohio Oil Co., Shreveport,

Executive breakfast attended by officers and speakers: J. E. Bailey, Tide Water Associated, Kilgore; Carl Maples, A.P.I., Dallas; E. A. Wahlstrom, Goldsmith Pool Engineering Committee, Midland; S. W. Oberg, Humble Oil & Refining Co., Houston; Stewart E. Buckley, Humble, Houston; W. S. Morris, East Texas Engineering Association, Kilgore (newly elected district chairman); Arthur G. Levy, Crown Central Petroleum Co., Houston (retiring district chairman); Carl Young, director of A.P.I. Division of Production; L. A. Ogden, Pure Oil Co., Fort Worth; Bruce Barkis, Lane-Wells Co., Los Angeles; W. E. Schoeneck, Ohio Oil Co., Shreveport; and Gordon Richmond, Hughes Tool Co., Houston

La., presided at the opening technical session Friday morning.

"Well Treatment After Perforating," was discussed by Bruce Barkis, Lane-Wells Co., Los Angeles, Calif. (See page 176 of this issue.) He stated that while well-cleaning methods now used result favorably, but little is known regarding the material removed from the well during the cleaning operation, nor regarding the free passage of oil through the area adjacent to pipe perforations at the producing zone. All who entered into the discussion of this subject agreed that it was quite important and deserved serious consideration as a matter for future research.

OFFICIALS IN CONFERENCE: *W. S. Morris, newly elected division chairman; Arthur G. Levy, retiring division chairman and 1938-39 head of the advisory committee; Carl A. Young, Dallas; and L. A. Ogden, Fort Worth.* At left: *W. E. Schoeneck, presiding officer at the first technical session; Gordon Richmond, division secretary-treasurer; and Stewart E. Buckley, author of the paper on "Pressure Production Relationship in the East Texas Field"*

Threatening East Texas operators with a substantial loss in ultimate recovery, and reduced natural flowing life for their wells, if volumetric withdrawals from this huge reservoir are not checked, Stewart E. Buckley, Humble Oil & Refining Co., Houston, spoke on "The Pressure Production Relationship in the East Texas Field." Some of his highlight statements were:

"Should the future rate of increase follow the same trend, then the entire benefits expected to be obtained through restricted rates of oil production are in danger of being obliterated during the next two years. . . . It is indicated that the supposed increased rate of water production would lower the pressure more in the next two years than the oil production alone would lower it during the remainder of the life of the field. . . . Every barrel of water produced would therefore exact a sizeable economic toll, neglecting entirely the additional costs which would be entailed to dispose of this water."

Salt Water System

"Factors in Design of a Salt Water Gathering System" was the concluding subject on the morning session, handled by J. E. Bailey, Tide Water Associated Oil Co., Kilgore (page 179 of this issue), who discussed several factors involved in transportation of oil field brine, stating that brines from each well should be analyzed and material for handling them subjected with properly resistant properties. The major problems, he said, are to prevent corrosion and deposition of scale. Brief descriptions of salt-water gathering system design and construction were also given.

E. A. Wahlstrom, Goldsmith Pool Engineering Committee, Midland, presided over the Friday afternoon session.

W. T. Doherty, division superintendent for Humble Oil & Refining Co., Midland, had as the subject for his informative paper, "The Permian Basin and Its Drilling and Production Problems." This extensive area, comprising over 150,000 square miles, having 9,411 producing wells, a daily production of around 300,000 bbls., almost 400 drilling rigs, and over 2,000,000,000 bbls. reserves, offers many problems for study, he said. After giving a discussion of the geology of the Permian Basin "from the layman's point of view," he touched briefly on the more important problems of the area.

Completion Practices

Another paper which drew much comment was on "The Use of Drilling Time in Determining Completion Practices—Goldsmith Pool," by Max David, geologist for Landreth Production Corp., Midland. As fully explained by the author, the proper logging of the pay section throughout the Big lime section of West Texas has always been a problem, especially while using rotary tools. Very little data were available for completion, reconditioning, or analytical purposes. Drilling time records, when properly taken and wisely employed, offer great assistance in the solution of this problem. Mr. David's full paper is published on page 69 of this issue.

"Marine Drilling on the Gulf Coast," by I. W. Alcorn, Pure Oil Co., Houston, summarized the many difficulties encountered in this type of operation. A total of 107 marine wells was drilled along the Gulf Coast of Louisiana and Texas during 1937, most of which were in Louisiana. The author described typical drilling locations in submerged areas, and how such problems as communication, housing, transportation, foundations, etc., are being met at this time.

Those named to the advisory committee for the year 1938-39 follow:

Arthur G. Levy, Crown Central Petroleum Corp., Houston, Tex., chairman; Edward Freeman, Texas Co., Houston, Tex.; E. H. Blum, Atlantic Refining Co., Dallas, Tex.; A. R. Campbell, Mid-Continent Oil and Gas Association, Shreveport, La.; M. G. Cheney, Anzac Oil Corp., Coleman, Tex.; Sid Childress, Rio Bravo Oil Co., Houston, Tex.; J. D. Collett, O'Keefe & Collett Corp., Fort Worth, Tex.; Jake Haman, Cox & Haman, Dallas, Tex.; Charles Fitzgerald, Sinclair Refining Co. (pipe line department), Fort Worth, Tex.; C. L. Gladden, Magnolia Petroleum Co., Dallas, Tex.; R. G. Hamaker, Reed Roller Bit Co., Houston, Tex.; John S. Ivy, Union Producing Co., Houston, Tex.; J. S. Hasson, Ohio Oil Co., Shreveport, La.; Casey Cunningham, Standard Oil Co. of Texas, Dallas, Tex.; C. W. Hughes, Arkansas Natural Gas Co., Shreveport, La.; J. C. Johnston, Continental Oil Co., Fort Worth, Tex.; R. B. Jones, Panhandle Refining Co., Wichita Falls, Tex.; J. W. Jordan, Sinclair Prairie Oil Co., Midland, Tex.; E. A. Landreth, Landreth Production Corp., Fort Worth, Tex.; A. M. McCorkle, Stanolind Oil & Gas Co., Fort Worth, Tex.; W. S. Morris, East Texas Engineering Association, Kilgore, Tex.; R. S. McFarland, Seaboard Oil Co., Dallas, Tex.; J. R. McWilliams, Standard Oil Co. of Louisiana, Shreveport, La.; L. M. Moffitt, Triangle Drilling Co., Shreveport, La.; J. A. Ritter, Sun Oil Co., Dallas, Tex.; C. F. Roeser, Roeser & Pendleton, Inc., Fort Worth, Tex.; A. H. Rowan, Rowan & Nichols Oil Co., Fort Worth, Tex.; J. H. Russell, Gulf Oil Corp., Houston, Tex.; E. H. Salrin, Tide Water Associated Oil Co., Houston, Tex.; J. R. Suman, Humble Oil & Refining Co., Houston, Tex.; C. E. Sutton, Pure Oil Co., Houston, Tex.; Al Buchanan, San Antonio, Tex.; A. J. Galloway, Shell Petroleum Corp., Houston, Tex.; E. Ruebsamen, Trinity Drillers, Inc., San Antonio, Tex.

Madison Verdict Assailed by Counsel for Defense

MADISON, Wis., Mar. 29.—Basic justice of the verdict returned here in January convicting 16 oil companies and 30 executives of conspiracy to violate the antitrust act, was questioned in federal court arguments today.

Seeking reversal of the jury's finding, defense attorneys assured Judge Patrick T. Stone they believed he had presided fairly and impartially but at the same time asked if a fair trial was possible under the entire psychology and atmosphere of the prolonged case.

John L. McInerney, Chicago, counsel for Standard Oil Co. of Indiana, insisted the jury could not have given the case thorough consideration and return a verdict in seven hours.

It was as good a jury as could have been selected, but the task imposed was too great, McInerney held, and, he declared, it cannot be denied there was some psychology in the minds of the jurors that if the defendants were not guilty the government would not have tried them.

There is a great deal of sentiment throughout the country, he said, that these men have been punished for honest efforts to help the government in a time of crisis.

Dan Moody, former governor of Texas, launched an argument just before noon today on behalf of Dan Moran, Houston, president of Continental Oil Co., and Harry J. Kennedy, general manager of sales, contending the evidence against them was insufficient to sustain a verdict of guilty and denying that Moran, a mechanical engineer, had any knowledge of a gasoline buying program.

Argument opened with a plea on behalf of Standard Oil Co. (Indiana) and three of its officers, E. G. Seubert, Allan Jackson and Edward J. Bullock, for reversal of the verdict on ground that Standard "had no place in the case."

Standard Oil, said Attorney Weymouth Kirkland, entered into no agreement, legal or illegal, to purchase distress gasoline, and if there was any conspiracy at all, it was a conspiracy to purchase distress gasoline, he argued.

Kirkland challenged the government to show "a scintilla of evidence that Standard bought a quart of distress or surplus gasoline."

He accused prosecution counsel of ignoring the evidence in its arguments and in its brief, a 69-page document devoted exclusively to argument supporting the verdict of guilty against Seubert and three other presidents of convicted companies—Jacob France of Mid-Continent, Dan Moran of Continental Oil and Henry M. Dawes of Pure Oil Co.

All other defendants, corporate and individual, the government's brief contended, were conclusively implicated in the conspiracy by being named specifically in testimony or in documentary evidence. The evidence against these four, while no less strong than that against the other individuals, was more largely circumstantial, the government conceded, while insisting that when viewed as a "composite whole," it led irresistibly to the conclusion that they authorized the participation of their companies in the conspiracy.

Standard Oil Co. (Indiana) was convicted of participating in an agreement to raise tankcar prices artificially through purchasing from Mid-Continent independents. Kirkland pointed out that the company entered into an agreement with Waggoner Refining Co., its alleged "dancing partner," early in 1934, long before the alleged beginning of the conspiracy, for purchase of Ethyl gasoline, and it purchased nothing but 69-70 octane gasoline from Waggoner until November, 1935. At that time it bought 25 carloads of third-grade gasoline from Waggoner, but this was not "distress" gasoline, and the Waggoner company, wealthy and independent, had no "distress" gasoline, he insisted.

The government subpoenaed 98 boxes of Standard files but found "not a scrap of evidence," because the only agreement Standard entered was with Waggoner, Kirkland said. While contending the general buying program was perfectly legal, he reiterated that Standard was "not a party to it."

Seubert, Jackson and Bullock attended nothing but legal meetings called in connection with Planning and Coordination Committee activities with which they were officially engaged, Kirkland argued, and no representative of the company except Bullock, as vice president in charge of purchasing, attended any meeting after January 5, 1935, when the appointment of a committee to investigate the condition of small refiners was announced, he said.

Bullock, he continued, was shown by the evidence to have taken a position strongly opposed to any buying program. He quoted Robert W. McDowell, chairman of the tankcar stabilization committee which allegedly engineered the Mid-Continent buying program, who testified that he had "got so little satisfaction out of Bullock" that he quit wasting telephone expense on him.

At the outset of his argument, Kirkland, announcing that he desired to "right a wrong," assured Judge Stone that nobody connected with the case instigated or had anything to do with inferences that he was selected by the government as a "friendly judge" and Madison as a "friendly forum" for trial of the case.

"Since we were here in January, a regrettable incident has occurred," he said, apparently in reference to reports of the United States senate committee session at which Robert H. Jackson, assistant attorney general, was interrogated by members who questioned the fairness of the government's procedure.

"According to the public press, someone made a statement, or an inference, that your honor was selected because you were a friendly judge," Kirkland declared. "I want to say on behalf of myself and my clients that this is a base slander as shown by your honor's conduct of the case." The judge, he added, had considered the evidence soberly and, "I believe, impartially."

"I think your honor's conduct of the case refutes any such ridiculous charge," Kirkland said.

The government, in its brief, took the position that Seubert, France, Moran and Dawes were shown to have been "active" as executives of their companies, and that it was inconceivable they did not know of and authorize participation.

If the circumstances against these four could be explained as consistent with innocence, the prosecution demanded, "why did not the defendants explain them?" That not a single defendant president took the stand to offer affirmative evidence that he did not participate in the conspiracy, the brief alleged as "one of the most significant facts in the entire case."

The document concluded with an assertion that "in view of the liberal trend of the cases today expanding the liability of corporate officers . . . the very least this court can do is to sustain the verdicts so that an appellate court may pass on the sufficiency of the evidence and place responsibility for the crime upon those officers who unquestionably were most responsible for its commission."

Briefs also were filed just before the argument opened on behalf of President Dawes, Vice President C. B. Watson and R. H. McElroy, Jr., wholesale sales department manager of Pure Oil Co.

"We propose to show conclusively," said the Dawes brief, "that the jury absolutely disregarded your honor's instructions by failing to return, as to this defendant, a verdict of not guilty."

Evidence under the law, as stated in the court's instructions, was "wholly insufficient" to justify a verdict of guilty against Dawes, it claimed, and the government was challenged to point to any testimony which would justify the jury in finding two essential facts necessary to establish guilt—that he had knowledge of the existence of any combination or agreement to raise and fix gasoline prices, or that he ordered or did any of the acts alleged.

Likewise, the Pure Oil attorneys, C. I. Francis and Carl N. Hill, contended the evidence against Watson was purely circumstantial and "falls far short of excluding every hypothesis but that of guilt." In Dawes' case, they pointed out, he attended no meetings; that C. E. Arnott, alleged "master mind," denied even having talked to Dawes about the buying program, and that there was no way in which Dawes could be connected except by "surmises" and the practice, condemned by courts, of piling "inferences on inferences."

There was testimony that Watson was invited to attend two meetings, at which the buying plan was discussed, but the record also showed he attended neither, the brief stated. Arnott "assumed" that he talked to Watson, but did not specifically recall having done so.

The evidence against McElroy also was circumstantial and "more consistent with his innocence than with guilt," it was claimed. McElroy attended three meetings mentioned in the testimony but at none of them did he undertake to speak for Pure Oil, counsel argued, and, pointing out that the company's purchases from independents were small compared with its total purchases, the brief said:

"If McElroy knew that the purpose of the buying program was to raise prices, then why did he not obtain all of the Pure Oil Co.'s requirements over and above its manufactures from independent refiners in the East Texas and Mid-Continent areas? That would have been the normal and reasonable thing to do if he thought he was engaging in an unlawful program."

Texas Wins Spacing Case In State Supreme Court

AUSTIN, Tex.—In the Brown vs. Humble Oil & Refining Co. case involving right of the railroad commission to permit drilling of oil wells on subdivided tracts, the Supreme Court dismissed application for writ of error by Humble, which claimed the commission should not have authorized a well on a 1½-acre tract in Gregg County.

The tract had been formed by dividing a 3-acre area after one well had been drilled. Humble did not dispute the right to the one well, but claimed the subdivision precluded a second.

Assistant Attorney General Harry Pollard, who represented the commission, said the Supreme Court action, which in effect upheld decisions of the lower courts, sustained the state's position that the commission could consider the subdivided tract as a part of the whole in determining the need for a well. The commission's action in permitting a second well on the 1½-acre tract was justified, he said, on the theory it was needed to prevent waste of oil from the 3 acres.

Texas Net Allowable Production In April 1,318,437 Bbls. Daily

AUSTIN, Tex.—The Texas Railroad Commission has ordered another month of Sunday shut downs in April and made the basic allowable production of crude oil in the state 1,510,337 bbls. per day as of April 1. Deducting 191,900 bbls. per day because of idle fields on the four Sundays in the month the net allowable as of April 1 will be 1,318,437 bbls. per day.

The OIL AND GAS JOURNAL

PRODUCING REFINING NATURAL GASOLINE PIPE LINE

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April Operations

It must be clear to everyone by this time that both the producing and refining branches of the oil industry must continue to restrict their operations during the next 30 days or possibly for a longer period.

Failure to do this will mean that the industry will not benefit from the gradual improvement in conditions for a large part of the industry apparent over the past few weeks.

Too large crude oil production and heavy crude runs to stills during the latter part of last year and the fore part of this year have resulted in excessive supplies, preventing the industry from reflecting the seasonal demand for its principal products which will get under way in April.

Had the industry kept its supply and demand in balance, with reasonable additions to gasoline inventory, during the winter, it could now expect a gradual increase in all its operations.

Developments in refining have been encouraging, starting early in March. Since the first of the year refiners have reduced their crude runs to stills more than 200,000 barrels daily, and large increases to storage are apparently ended.

But they have the immediate problem of approximately 93,000,000 barrels of gasoline on hand. This is not necessarily a fatal condition for the industry provided the producers are willing to continue low operating schedules until these gasoline stocks are reduced in line with working requirements.

Competent observers say that this threat to the spring and summer gasoline markets can be removed within 30 to 60 days, assuming that operators are willing to keep their total runs to stills around 3,100,000 barrels a day.

This, of course, means that crude oil production can not be expanded in the immediate future. April production in fact should be lower than in March. Due to reduced refinery operations 1,853,000 barrels of crude were added to storage during the two weeks ending March 19. The industry, from the present outlook, does not need any additions to crude storage this year.

Secretary Ickes summarized the setup last week when at his press conference he said:

"I have always contended that we can preserve crude more effectively underground. Besides, it is safer and cheaper. The companies, themselves, should realize they could serve themselves best by not taking excessive supplies from the ground."

It must be emphasized again that this burden of curtailing producing operations must be divided equitably among the states. Some have done more than their full share. Others have been strong on promises and weak in performance.

It does no good to set a state allowable at one figure and then actually produce from 5 to 10 per cent in excess of that goal. This has been the chief source of trouble for the industry for the past two months.

The condition of the industry in April usually determines the course of the market during the main consuming season. Top-heavy stocks overhanging the market at the start, if not speedily corrected, impose a handicap right through the summer, and cheat the industry of its expectations.

The industry has been battling heavy seas during the past few months and cannot be permitted to founder at the entrance to the harbor. With more general cooperation and less holding back or indifference, a stability can be secured that will assure the industry the prosperous season that the increasing demand for many of its products justifies.

DIPLOMATS

(Continued from Page 51)

along the route which would eliminate cutting through virgin soil and undergrowth. It is estimated the Poza Rica line to Mexico City could deliver 40,000 to 50,000 bbls. daily to the Pacific Coast by the 200-mile extension and addition of pumping stations.

Japanese Attitude

The reports of Japanese interest in Mexican oil were claimed to be based on negotiations of private companies which import, refine and distribute in Japan. Press dispatches from Tokio said authoritative sources confirmed negotiations looking to the purchase of 500,000,000 gallons (nearly 12,000,000 bbls.) annually. Official Japanese quarters did not comment extensively on the proposal but Premier Konoye said his government's attitude would be governed by final disposition of the matter. Eventually, it was indicated by press dispatches, the Japanese government might purchase fuel oil for the navy and other petroleum products from Mexico if such purchases could be made at favorable prices without infringing on British and American rights. It was said informal offers to sell have been received in Tokio from the Mexican government, but Japan rejected them pending clarification of the Mexican government's right to confiscate the properties. Much will depend, it was said in Tokio, on the attitude of the British foreign office and the American government. If the British and American governments declare the action of Mexico illegal then Japan will make no purchases as the country was said to be unwilling to offend London and Washington.

Sachiro Koshida, Japanese minister to Mexico, confirmed in Mexico City reports that private interests in Japan were considering buying Mexican oil. He said the Japanese tanker Itsu Kushima Maru was due in Tuxpan to take on an oil cargo Monday, coming from Europe, where it discharged whale oil. The Japanese tanker was returning empty and a call for oil cargo at Mexico might be logical under normal conditions.

Another plan reported as under consideration by Japan involves construction of a pipe line from the Poza Rica field across the Isthmus of Tehuantepec to Salina Cruz, 140 miles over mountainous country. Japanese ministers in both Mexico and the United States discounted the report due to the expense involved of building the line and equipping ports on the Pacific to handle the traffic. There was also much conflict in reports on the amount of oil Japanese companies are considering buying from Mexico. One report was that 500,000 bbls. annually was the volume in mind which would do little to relieve Mexico's marketing problems.

Entrance of Japan into the Mexican oil picture has broad significance in the eyes of the American government. Aid from Japan in meeting current difficulties of Mexico might gain Japan a position of preference there. There is also the economic consideration. Consummation of arrangements for substantial quantities of oil from Mexico would materially reduce the purchases in this country by our second largest oil customer. In 1937, Japan purchased 16,047,000 bbls. of crude in the United States; 1,402,000 bbls. of gasoline; 6,308,000 bbls. of gas oil and distillate fuel; 4,045,000 bbls. of residual fuel; 444,000 bbls. of lubricating oils and 181,000 bbls. of kerosene, or a total of 28,429,000 bbls. of petroleum. With the exception of Canada no other customer came near the volume sold to Japan.

At the end of last week, the Mexican government launched a counter attack on the oil companies which observers interpreted as a move to diminish or possibly wipe out the claims for indemnification. The government presented bills totaling about $2,000,000 for back taxes allegedly due from Aguila (Royal Dutch-Shell) and Huasteca (Standard of New Jersey). Aguila was charged with failure to pay $1,400,000 absentee tax on funds sent out of the country in 1934-35. Huasteca was billed for $600,000 alleged due in absentee and income taxes. The claims were denied by both companies. The Shell group said validity of such a claim against it would have involved sending out of Mexico more than $35,000,000.

The Mexican government was compelled to draw on the Bank of Mexico to meet the payroll of oil workers last Saturday. Under protest, a cashier for Mexican Eagle Oil Co. was compelled to open the company's safe and approximately $11,000 found there was embargoed and the company ordered to pay the balance of the $1,400,000 claim in back taxes by Monday. The action may give some clue as to the desperate need for funds in the government's attempt to operate the oil properties.

An executive of one of the large companies whose properties were seized let it be plainly understood that anyone buying "his company's oil" from the Mexican authorities would also receive a bill from the company, whether the government was paid or not. Reports were circulated in New York that an eastern group was offering Panuco crude at 50 cents per barrel, f.o.b. Tampico. In some quarters it was thought the price of 50 cents per barrel might have been a speculator's offer to see if interest could be aroused. Until the expropriation decree was issued, Panuco crude was generally quoted at about 95 cents.

Herrera in Charge

With regular supplies of motor fuel interrupted, some of the outlying districts of Mexico were becoming hard pressed to meet internal demand, chiefly from tourist trade. In the northern state of Sonora, just across the international boundary, the shortage was particularly acute. Border officials at Nogales, Sonora, said they had received orders from Mexico City not to permit railroad tankcars carrying gasoline or oil to leave Mexico. It was estimated General American Tank Car Co. had between 150 and 175 tankcars in Mexico when the expropriation decree became effective.

Vincente Cortes Herrera, under-secretary of communications in Mexico, heads the newly created administrative council of Mexico for operation of the oil properties. The council has established itself in the Mexican Eagle Oil Co. building at Mexico City which was completed last December, but had not been occupied.

Two former truck drivers are now the heads of Sinclair Mexican Oil Co. One is president and general manager and the other is chief counsel.

Official Mexican figures give exports of crude and refined petroleum in 1936 as 25,039,665 bbls., principal destination being United States 9,034,755; Great Britain 6,243,806; Germany 2,635,510; Aruba, Netherlands West Indies 2,752,938. Japan took only 6 bbls. Figures for 1937 are not available but it is not believed Japan purchased important quantities.

Obituaries

CHARLES F. (TODE) GARDNER, 53, Tulsa, lease and land man for W. C. McBride, Inc., died March 26 of a stroke in the St. Louis offices of the company. He had been employed with the firm for 12 years. He had just returned from a business trip to the Illinois oil fields near Olney.

WILLIAM H. SHINN, 67, Bartlesville, Okla., identified with the oil business in Kansas and Oklahoma for many years, died March 26.

GEORGE R. CROSBY, Sun Oil Co., Jacksonville, Fla., died recently at Saranac Lake, N. Y., after a lingering illness.

MISS RENEE ARSENAULT, chief secretary at the Imperial Oil offices at Edmonton and later at Calgary, Alberta, from 1918 to 1935, died at Calgary recently, following a lingering illness.

L. F. ICE, 47, Tulsa drilling contractor since 1924, died March 24. He was part owner of the Ice Drilling Co. and was born in West Virginia.

ERNEST GODWIN CHRISTIAN, 63, of Liberty, pioneer oil man of Texas, died last week. He was one of the first drillers of the Spindletop field, near Beaumont, and helped develop Batson field.

JOE T. HOLLENBACK of Oklahoma City, brother of H. R. Hollenback, widely-known Oklahoma wildcat driller, died March 21.

ALBA B. JOHNSON, JR., 51, associated with the export sales department of Atlantic Refining Co., died last week in Philadelphia.

JOHN MURDOCK, 36, rig foreman for Rex Rig & Construction Co., died from being struck by a falling metal brace which rebounded to where he was operating a winch at a well in the Oklahoma City field.

L. M. BEATTY, 89, Bartlesville, Okla., pioneer and a former drilling contractor in Pennsylvania oil fields, died last week.

DAVID HIRAM SNYDER, 62, of Bartlesville, Okla., died suddenly March 17. He had long been identified with the oil business, starting in the Pennsylvania oil fields and later going into Ohio and Illinois. He moved to Bartlesville in 1912.

Production Division Program For Pacific Coast District

The program for the spring meeting of the Pacific Coast district A.P.I. Division of Production to be held at the Biltmore Bowl, Los Angeles, Calif., April 19, follows:

9:30 a.m.—Drilling Practice. Safety in the California Petroleum Industry by J. C. Hoyt, petroleum safety engineer and inspector, Bureau of Industrial Accident Prevention of Industrial Accident Commission.

Vocational Training by J. C. Beswick, chief of bureau of trade and industrial education.

Recent Pressure Drilling at Dominguez by Sam Grinsfelder and Jan Law, Union Oil Co.

Oil Well Cement by Gene Davis, Texas Co.

2:00 p.m.—Production Practice. Tentative Equilibrium Constants for Light Hydrocarbons by B. H. Sage, B. L. Hicks, and W. N. Lacey, California Institute of Technology.

Practical Use of Instruments in Studies of Pumping Wells by Ned Clark, H. F. Dangberg, and Paul L. Kartzke, Shell Oil Co.

Production Problems in the Wilmington field by C. J. Dean, General Petroleum Corp.

7:00 p.m.—Dinner.

Dollars and Sense by R. K. Davies, vice president, Standard Oil Co. of California.

Magnetic Storms

Tucson, Arizona, observatory of the U. S. Coast and Geodetic Survey report a moderate magnetic storm began at 3 p.m. March 21 and ended at 5 a.m. March 23. A second storm of moderate intensity started at 11 a.m. March 23 and ended at 5 a.m. March 24, central standard time used in reporting.

Petroleum Sessions at Metal Congress

By L. P. STOCKMAN and T. P. SANDERS

K. V. King, Standard Oil Co. of California, regional vice president of American Welding Society; Wayne Howard, supervisor of tests for General Petroleum Co. and program chairman of A.W.S. western regional conference; and P. D. McElfish, chairman of Los Angeles section, A.W.S.

LOS ANGELES, Calif., Mar. 26.—At the Western Metal Congress held in Los Angeles from March 21-25 a wide range of topics, many of special interest to the oil industry, was presented and discussed. Total registration was 4,322 and attendance at the metal exposition in Pan Pacific Auditorium was in excess of 28,000. Cooperating with the Metal Congress was the American Institute of Mining and Metallurgical Engineers, American Welding Society, American Society for Metals, Pacific Coast Gas Association with support from members of the American Ceramic Society, American Chemical Society, American Foundrymen's Association, American Institute of Electrical Engineers, American Society of Civil Engineers, American Petroleum Institute, American Society for Testing Materials, Institute of Aeronautical Sciences, Metal Trades and Manufacturers' Association, Mining Association of the Southwest, National Purchasing Agents Association, Pacific Coast Electrical Association and Society of Automotive Engineers.

R. L. Wilson, metallurgical engineer of Climax Molybdenum Co., presented a paper on alloy steel tubing for oil heaters in which he brought out that higher temperatures employed in cracking operations, use of high temperatures and pressures in thermal polymerization of hydrocarbon gases, and the refining of the more corrosive crude oils have been responsible for the evolution of a number of new alloy steels for process coil tubing in oil heating furnaces. The paper described the effect of the various alloying elements on the corrosion, oxidation, high-temperature strength, and air-hardening of refinery tube steels. Many of the newer compositions were classified according to their serviceability and the latest creep data were tabulated for some types.

A second paper prepared by Mr. Wilson dealt with the high-temperature strength of steels, the behavior of steels under stress at elevated temperatures, with special emphasis on the different characters of the deformations at temperatures below and above the lowest temperature of equicohesion. At temperatures below the equicohesive temperature the short-time tensile test is regarded as a satisfactory basis for reliable designs, while at higher temperatures it is advantageous to select materials and calculate designs on the basis of some strength value determined in long-time tests. Tensile creep tests and long-time tensile rupture tests were discussed as means of evaluating the high-temperature strength of steels. In another paper, prepared by A. E. White, C. L. Clark and Walter G. Hildorf, various ways were revealed in which the data from the stress-rupture test can be used for determining the high-temperature characteristics of a given steel. Among the characteristics revealed by this test are the load-carrying ability, and the influence of time, temperature, stress and atmosphere on the structural and surface stability. It was also shown that in many cases a rather definite relationship exists between the stress-rupture and creep characteristics.

Petroleum Sessions

Lester G. Metcalf, manager of refineries of Union Oil Co., presided as chairman of the opening session of the petroleum and process industries group. The first speaker, C. J. Coberly, member of A.S.M.E. and president of Kobe, Inc., discussed the problems encountered in deep-well pumping. Laurence G. Bean, member of A.S.M.E. and mechanical engineer of Bristol Co. of Waterbury, Conn., brought out the general characteristics of liquid, vapor tension, or gas-operated thermometer systems with comments regarding their operating limitations. At the evening session, presided over by Chairman E. E. Sharpenberg, Fritz Karge, engineer of transportation of Union Oil Co., discussed methods used to move high-viscosity crude oil from the Santa Maria Valley field; J. H. Rickerman, W. E. Lobo and A. L. Baker discussed fundamentals of design of cracking furnaces. It was brought out that in designing cracking furnaces unusual engineering attention is required because of the numerous variables. The authors discussed the procedure from various standpoints, emphasizing importance of proper combination of heating surface, well designed burners and correct handling of furnace draft to obtain good heat distribution.

M. J. Gavin (right), Los Angeles manager for Foster Wheeler Corp., welcoming to California's sunshine R. D. Spear who came from the New York office to attend the convention. Both are members of A.S.M.E.

Symposium on Welded Casing

K. N. Saatjian of Texas Co. and Walter Main of Youngstown Sheet & Tube Co., presented a comparison between welded and coupled casing strings, giving a frank discussion of the present limitations governing the use of welded casing joints. Welded-joint water and oil strings are comparatively new, and while important strides have been made in all welding work, it is possible further improvements will be necessary before the oil operator is materially aided in landing long strings, one of his most difficult tasks.

Comparisons reveal that welded joints are believed to possess greater joint efficiency than coupled joints, unless upset pipe is used. In general, butt-weld joints are stronger than the bell-and-spigot type. However, collapse strength is usually the limiting factor rather than joint tensile strength. Welded joints have practically no trouble with leaks, but, taken all in all, there is less uncertainty with coupled joints because of the greater opportunity for inspection.

Weldability and Properties of Materials for Casing Strings

J. C. Hodge and L. H. Sadler of Babcock & Wilcox Co., New York, have carefully considered the materials which may be used in welded casing strings. Due to the speed with which welded joints must be made up and lowered into the hole, the choice of casing steels must be limited to those which will not possess excessively hard and brittle weld-affected areas as a result of rapid cooling. Hardening alloying elements must be kept at a minimum to secure weldability and avoid brittleness.

Carbon has the most pronounced hardening effect, so this must be limited to .40 or .45 per cent when the usual quantities of manganese and silicon are present in the steel. Since phosphorous acts essentially the same as carbon, the sum of the phosphorous and carbon should be considered as equivalent carbon content.

Grade D casing is too high in carbon and manganese content for welding in casing strings. However, casing steels to meet the physical requirements of Grade D pipe may be produced by subjecting a steel of low carbon and manganese con-

tent to cold working by a compression treatment, or by hardening heat treatment with or without subsequent draw, or through the use of low-alloy steels with sufficient alloying elements to produce the physical properties in the as-rolled, or normalized, condition.

Field Practice in Welding Casing Strings

Howard Newby, of American Pipe & Steel Corp., Los Angeles, Calif., outlined the necessary steps in proper organization of crews and materials for running welded-joint casing strings. To be attractive to the oil operator, running of welded casing must be comparable in speed with coupled casing of the same size. Work must be organized to such an extent that there is no lost time, since the drilling equipment and crews must be tied up during the casing job.

Welders used on casing jobs must have special qualifications as the work has requirements differing from those of ordinary welding. Stabbing is an essential consideration, and it is important that the pipe is not moved during the welding. Internal rings to fit the ends of the pipe have been found advantageous since stabbing is simplified.

Design and Fabrication of High-Temperature and High-Pressure Piping

Increased use of high pressures and temperatures in steam plants and oil refineries has forced the designer to look for better means of joining tubular sections, according to F. C. Fantz of Midwest Piping & Supply Co. The high cost of flanged joints and difficulty of maintaining tightness have caused the use of welding whenever possible. Flanged joints are becoming limited to such places as require dissembling for cleaning.

Practically all present-day high-temperature piping is carbon-molybdenum steel, allowing weight reduction of about 40 per cent. In welding, this makes necessary stress relieving and heat treating of the finished assembly in order to avoid brittle weld zones.

Recognizing and Repairing Weaknesses in Existing Pressure Vessels

Recent improvements in design and metals have resulted in safer pressure vessels, but it is probable there will always be older vessels of questionable condition since a pressure vessel is an installation of comparatively long life. K. V. King and F. T. Patton of Standard Oil Co. of California, have outlined procedures for inspecting and repairing vessels.

The history of construction and operation should be carefully studied, as these data usually give important clues as to the present condition of the vessels. Date of construction usually suggests what weaknesses should be suspected. X-raying, while practical, is usually precluded due to the lack of portable facilities. The thickness of the shell must be determined by bore holes, and doubtful welded joints must be tested by cutting samples from them. It is usually possible to determine from past history whether or not internal corrosion has occurred.

Welded Joints, Which Ones to Use, When and Why

Probably the most important paper presented in the sessions of the American Welding Society was offered by Leon C. Bibber of Carnegie-Illinois Steel Co. The purpose of Mr. Bibber's presentation was to introduce data which would permit the drafting offices to design all welded joints in detail rather than leaving these decisions to the shop foreman. It was pointed out improvements could be made if the designers had sufficient data relative to costs and joint strengths. Comparative costs disclosed definitely that plates thicker than one-half inch could be machine-bevelled more economically than they could be torch-bevelled.

Metals Used in Pipe Line Construction and Operation

The paper by Lewis F. Scherer, assistant chief engineer for Texas Co. at Houston, Tex., covers an exceedingly wide scope. Steel pipes used in pipe line construction are classified as butt-weld, lap-weld, electric weld, and seamless. Butt-welded pipe is no longer used for high-pressure lines because of the difficulty of obtaining 100 per cent efficient longitudinal joints. Lap welds partially overcome this difficulty because of greater contact area. Electric-welded pipe has high ultimate strength,

David P. Vail, Los Angeles manager for Babcock & Wilcox Co., and Guy L. Warden, Los Angeles manager for Armstrong Machine Works

but seamless pipe is less apt to develop defects in service.

Welding of joints into a continuous line has become common practice in the last 10 years. While great strides have been made, it is believed the welded joint will always be a source of uncertainty until some simple means is found for detecting poor welds.

Most pipe lines are made of steel with carbon content less than .30 per cent. To a large extent this is due to the thermal effects of welding, which would tend to nullify the admitted advantages to be received through the use of high-carbon steel. Cast iron, wrought iron, and copper-bearing steel pipe have been found beneficial in handling corrosive oil or salt water, but their use is not general because of the difficulty of handling the first, and the initial cost, of the latter two. Until recently turns and other pipe fittings on welded lines were made in the field, but one-piece forged fittings recently offered have replaced these makeshift arrangements and resulted in increased strength and less resistance to flow.

Tanks present no metal problems except in the case of corrosive crudes and water. It is believed proper use of metals will eliminate most troubles of this type. The use of steel plates with stainless steel rolled or fused to one side is expected to solve many tankage problems.

Fundamentals of Design of Cracking Furnaces

By using proper design and operation 80 per cent efficiency may be obtained from cracking furnaces, it was contended in a paper by J. H. Rickerman, W. E. Lobo, and A. L. Baker, all of M. W. Kellogg Co., New York. Mr. Baker illustrated the advantage of using a separatively fired soaker section to permit closer regulation of temperature in each bank of tubes.

Heat distribution in the furnace was considered the most important single factor. The wall space of the furnace interior was classified as to heating value in the order of roof, floor, side walls, and burner walls, and it was shown the box space should not be used until all of the wall space had been utilized. Faulty or uneven combustion in a cracking furnace causes destruction of tubes, coking in the tubes, and impingement of flames. Forced draft has been found advantageous since it permits better regulation of combustion.

Corrosion is the chief factor causing loss of strength in cracking tubes. Oxidation and erosion are small factors. It is customary to design tubes for the required strength and then add extra wall thickness to take care of the expected corrosion. Cracking tubes most commonly used today are made of steel containing 2¼ per cent chrome and 1 per cent molybdenum, but stronger tubes are used in more vital places. Each bank of tubes in the furnace is designed separately.

The brickwork and the tubing supports in the furnace should require no maintenance costs. Most furnaces in use have been designed to facilitate cleaning operations. With new cleaning methods coming into use which are faster than the mechanical methods, it is probable designs will change radically in the near future.

Discussion by members of the audience brought out that coast experience did not favor the use of air preheaters on furnaces due to corrosion. It is believed, however, recent methods of protecting against corrosion will prove adequate for preheaters, thus making greater efficiency possible on the coast.

Design of Transmission Systems for Heavy Oil

In the Santa Maria Valley field the oil is so heavy heating is required in the storage tanks to permit the oil to drain freely into the pump station suction lines. Fritz Karge, transportation engineer for Union Oil Co., described the method by which a new pump station built by his company handles this heavy crude. Gas-engine-driven pumps and direct-fired heaters have been installed instead of the usual steam-driven pumps and exhaust-steam heaters. A recycling system is used whereby hot oil is returned to the storage tanks to raise the discharge temperature. Pumping is carried on in two stages, the heavy oil being pumped through heaters by the first stage before it reaches the main-line pumps. This system permits the lowest possible resistance to flow, since the heat is used to reduce viscosity.

Mr. Karge's paper was discussed at length by Fred Simms of Shell Oil Co. of California. Shell Oil Co. carried on the latest major pipe line construction work in California 18 months ago when it built a large San Joaquin Valley line. Since heavy crudes are handled by this line, the stations made use of a recycling system to lower the viscosity of the oil in the pumps. The system was characterized by automatic temperature regulation of the charge to all pumps, and the use of combination heaters and steam condensers.

California Program Is Moving Slowly

By L. P. STOCKMAN

LOS ANGELES, Calif., Mar. 28.—California's crude oil curtailment program is making slow progress. More than 14,000,000 bbls. of crude and refined oil have been added to stocks on the Pacific Coast since the first of the year and more than 18,000,000 bbls. since December 1. Crude oil, gasoline and fuel oil have all shown substantial accumulations but it is the consistent increase in gasoline stocks that is causing much of the present anxiety as there is very little suitable empty storage. Heavy crude and refinery residue can be dumped into reservoirs but this storage is not suitable for light refining crude due to evaporation and seepage losses and the fire hazard.

It is increasingly evident that all California fields must contribute additional curtailment to alleviate the situation. Curtailment during the next 10 days probably will determine the future of the price structure.

Reducing Production

In the Dominguez field where Shell Oil Co. and Union Oil Co. are the principal operators, each curtailed an additional 1,600 bbls. daily effective at 7 a.m. March 25. Both desired to make additional restrictions but are unable due to lease requirements and other factors. Henry Ford made a contribution by granting a concession in the Ford section of the Wilmington field whereby General Petroleum Corp. and Union Pacific Railroad Co. have been able to pinch back about 9,000 bbls. per day. The Ford interests granted General Petroleum Corp. permission to curtail production on the Ford lease by letting the operator produce 15 per cent of the potential production of the Terminal zone and 20 per cent of the potential production of the Ranger zone. Heretofore Ford has insisted General Petroleum Corp. produce not less than 25 per cent of the potential daily production of all wells on the Ford lease. This concession has permitted General Petroleum to cut production and Union Pacific Railroad Co. holding offset acreage to match the reduction. The Ford lease has an estimated potential of 40,000 bbls. per day from 25 completed wells on the 70 acres.

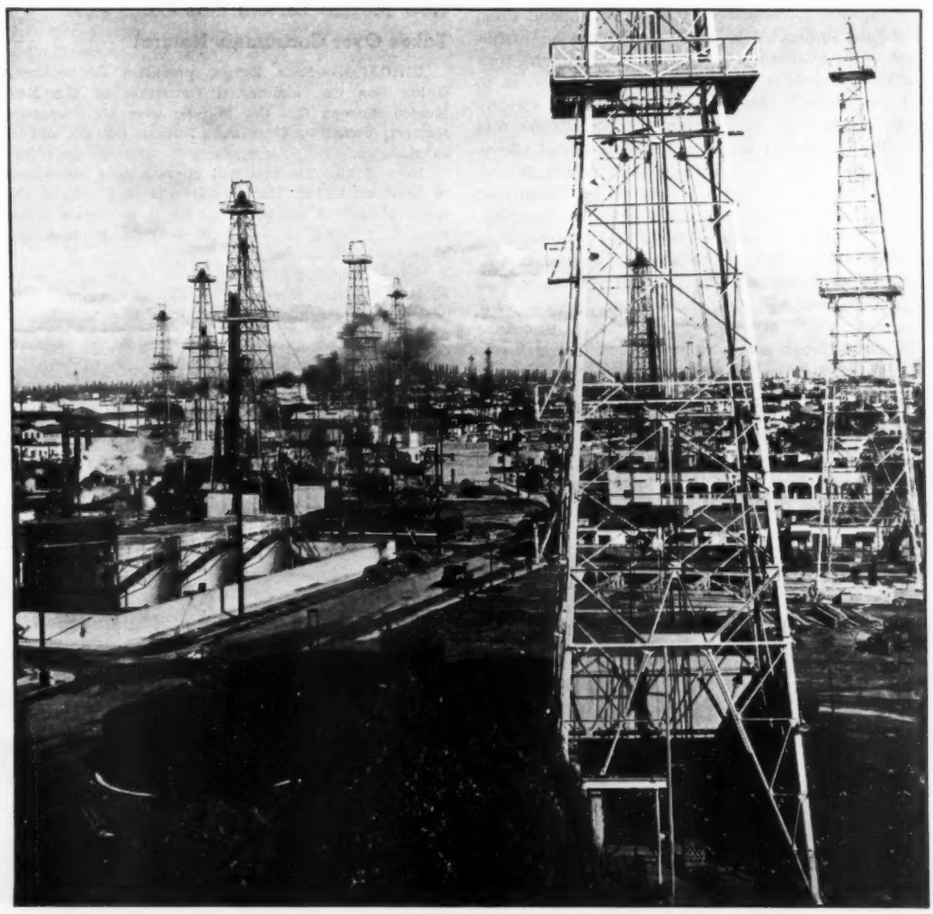
Operators in the Lake View section of the Midway-Sunset field have tentatively agreed to shut in all wells for five days beginning at 7 a.m. April 1. Two operators have held up final approval as they have been experiencing trouble with water and sand. Two engineers have been working on the proposal for two weeks and their report indicates it can be undertaken with safety. If no sand or water trouble results and the wells can be returned to production without trouble, operators have indicated their willingness of approving a 10-day moratorium each month. This section of the Midway-Sunset field has a daily quota of 11,200 bbls. but production has been averaging a little better than 17,000 bbls. A 10-day moratorium each month would bring this area into line and reduce pumping costs. Operators in Santa Fe Springs which has been exceeding its quota for several months are completing plans to bring this field into line. Some difficulty is being experienced in the Mount Poso and Round Mountain fields in effecting additional proration. Long Beach, El Segundo and Huntington Beach are out of line.

Key to Situation

The Wilmington field, more than any other area, holds the key to the present situation. When production began increasing alarmingly a few months ago, several attempts were made by Umpire Pemberton to secure compliance with proration. A warning went unheeded and finally Wilmington operators junked the curtailment program and established one of their own which permitted them to overproduce but which demanded strict compliance from operators in other fields. Wells in the Long Beach Harbor section of Wilmington were in the beginning flowed wide open and this continued until the lid blew off. Operators then decided some form of curtailment was advisable and formulated a program that new wells would be permitted to flow wide open for two weeks and then be pinched back to a maximum of 2,500 bbls. per well each day. This agreement was superseded by one setting the daily maximum at 2,000 bbls. per day but retained the preliminary open-flow period, and this agreement was in turn superseded by one permitting a new well to be flowed at the rate of 2,500 bbls. per day for two weeks and then be pinched back to a maximum of 1,000 bbls. each. If operators in the Long Beach Harbor section desire to maintain the price schedules they must at once limit the maximum not to exceed 500 bbls. at any time and eliminate the provision permitting a new operator to produce at the rate of 2,500 bbls. per day for two weeks.

Long-Range View

Taking a long-range view of existing conditions, the West Coast is face to face with an overproduction situation that will require either enactment of state legislation or extension of the proration program well into the future. The large undeveloped acreage in Wilmington, together with excessive potentials in North Belridge, Santa Maria Valley, Greeley and Ten Section, and the probability additional large potentials will be recorded in the Rio Bravo, Canal and similar fields, is ample evidence that voluntary proration or compulsory regulation will remain for several years. There is also the possibility that the Avenal zone of Eocene age in the Kettleman North Dome field may become a primary factor in future production as well as possible deeper zones in Ten Section, Greeley and Canal fields and other areas in San Joaquin Basin. At present the Santa Maria Valley, Ten Section Greeley, Rio Bravo and North Belridge fields are severely curtailed and are producing only a very small part of their capacities. A recent check showed there are 4,660 wells entirely shut in throughout the state and the amount of production curtailed approximates 200,000 bbls. per day. The actual quantity is probably nearer 300,000 bbls.



Inman

Active area in Wilmington field. Old Long Beach field in background

Natural Gas News

Ickes Holds Up Sale of Helium to Germany

WASHINGTON, D. C., Mar. 31—The refusal of Secretary Ickes to sell helium gas to Germany is the subject of much comment in the capital. The secretary will not sign a contract for sale of helium to American Zeppelin Transport, Inc., American agent for the German zeppelin company, until he has reached an agreement on the price and has received satisfactory assurance the helium will not be used for military purposes. He adheres to this position although the Munitions Control Board has authorized the exportation of helium to Germany and Mr. Ickes approved this license some time ago, while amended regulations under the helium control act recently signed by President Roosevelt, but for some reason not yet promulgated, established a complete formula for determining the price of helium set up elaborate safeguards against the use of exported gas for military purposes.

In passing the helium control act last fall, congress gave the Interior Department, through the Bureau of Mines, virtually a complete monopoly over production of helium in the United States and directed it be sold for medicinal and commercial uses and that it might be exported for airship use under restrictions including a guarantee it not be used for military purposes.

One of the principal purposes of congress was to permit the use of helium at a reasonable cost in treatment of respiratory diseases, for which it has recently been proved very efficacious. Since the helium is sold at about cost of production, the price for medical purposes will depend upon the total amount sold, and unless large quantities are made available for airship inflation, the unit price for medical purposes may be so high as to be prohibitive. One sale of helium has already been authorized by Secretary Ickes, 25,000 feet to Ohio Chemical & Manufacturing Co. of Cleveland, Ohio, for medical purposes, which is evidence the department is ready to go ahead and do business. The government plant at Amarillo, Tex., is ready to proceed on a full-time basis in production of helium as soon as contracts are signed. The German zeppelin interests have had cylinders for shipping helium at Houston for some time, and are exceedingly anxious to obtain the gas as soon as possible to start transatlantic flights of the new dirigible this summer.

The amended helium regulations state definitely that no purchaser shall permit the use, directly or indirectly, of any helium for military purposes, and also require that every contract for the purchase of helium to be used for airship inflation contain a stipulation for payment of liquidated damages in an agreed amount for failure to comply with the regulations, and shall be accompanied by a domestic corporate surety bond to the amount of the agreed liquidated damages to insure faithful compliance with all provisions of the regulations. Another new provision states that if the Secretary of the Interior shall find at any time that any purchaser of helium or any political authority has violated any of the regulations or has permitted the use of helium for military purposes, the liquidated damages shall be assessed and the bond forfeited. In addition, the regulations permit a representative of the United States government to inspect any airship and its contents containing American helium either in the United States or in any foreign country at any time and in any manner as required by the inspector.

Bow Island Gas Storage Now 10,500,000,000 Feet

CALGARY, Alberta. — Canadian Western Natural Gas, Light, Heat & Power Co. is continuing repressuring operations in the Bow Island field, the daily storage of waste gas from Turner Valley amounting to approximately 5,000,000 feet.

Operations were commenced in August, 1930, and it is estimated that at the end of 1937 some 10,500,000,000 feet had been stored. The field constitutes a reserve for the Canadian Western system, which at present draws practically its entire requirements from Turner Valley.

New Mexico Eastern Gas Co. Takes Over Consumers Natural

CHICAGO. — Ross Byron, president of Southern Union Gas Co., announced formation of the New Mexico Eastern Gas Co. to take over all properties formerly owned by Consumers Natural Gas Co. and its subsidiaries.

New Mexico Eastern will operate as a subsidiary of Southern Union. The consolidation is a step in the simplification of the Southern Union corporate structure, as a result of which all subholding companies have been eliminated.

All outstanding collateral trusts 6 per cent serial gold bonds dated November 1, 1931, of Consumer Natural Gas were called for redemption May 1.

Plea for Conservation of Gas Made at Fort Worth A.P.I.

FORT WORTH, Tex.—A plea for the same "careful and adequate" conservation for natural gas that producing states are giving to crude oil was made by John S. Ivy, vice president of Union Producing Co., Houston, to members of the southwestern district, division of production, American Petroleum Institute.

He said recent estimates of natural gas reserves of the United States indicated 62,000,000,000,000 feet to be presently in sight, and that of this amount, the southwestern states had about 47,000,000,000,000 feet, or about 76 per cent of all reserves.

Upon the basis of the 1936 rate of withdrawal, he said it was indicated that present known gas reserves had a life of 28½ years for the United States and of 33 years for the southwestern states.

He said that in Texas alone, a total of 1,036 billion feet of gas was produced during 1937. He declared that of this amount only 63 per cent could be regarded as utilized for light, heat, fuel and repressure purposes. The remaining 37 per cent either was utilized for carbon black or was blown into the air after extraction of gasoline.

Pipe Line Work

Royalite Pipe Line to Be Completed Early in May

CALGARY, Alberta—Work is being rushed on the new 6-inch pipe line of Royalite Oil Co., which is expected to be completed and in operation between the Turner Valley field and Calgary by May 1. The new line will increase the pipe line capacity from 13,000 to 24,000 bbls. a day, and completion may be followed by an increase of the present proration quota of 42 per cent of potential.

The first Royalite 4-inch naphtha line was laid in 1925, with a capacity of 5,000 bbls. a day. With the development of crude production in 1937 this proved inadequate and Royalite purchased the old 4-inch line of Alberta Pipe Line Co., increasing capacity to 10,000 bbls.

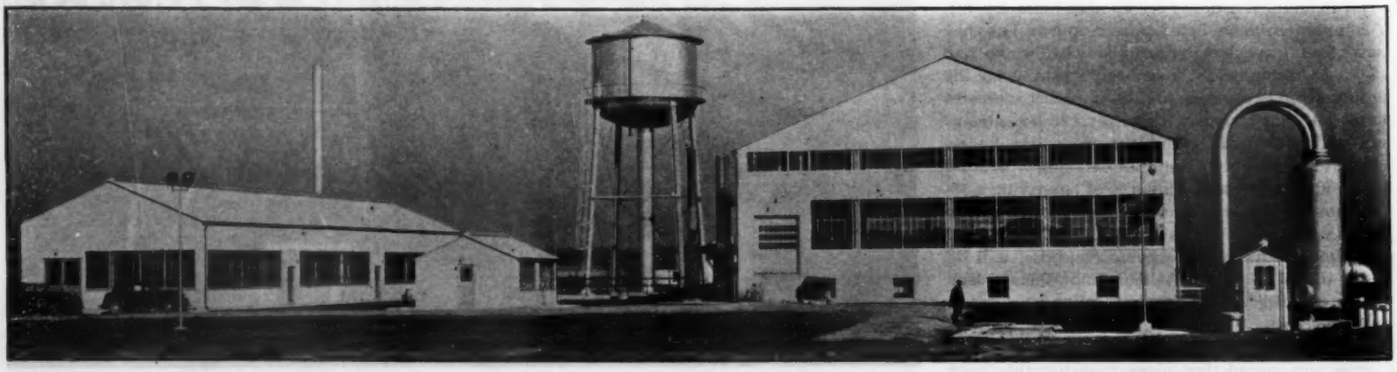
In October, 1937, work was started on 15 miles of 6-inch line which looped into one of the existing 4-inch lines 15 miles from Turner Valley, bringing the capacity to 13,000 bbls. This 6-inch loop is now being extended from the junction, 15 miles north of Turner Valley, to Calgary, and will increase the crude carrying capacity to 24,000 bbls. a day. In January, under 42 per cent proration quota, crude and naphtha production was around 14,225 bbls. a day.

United Gas to Lay Fuel Lines Throughout K.M.A. Field

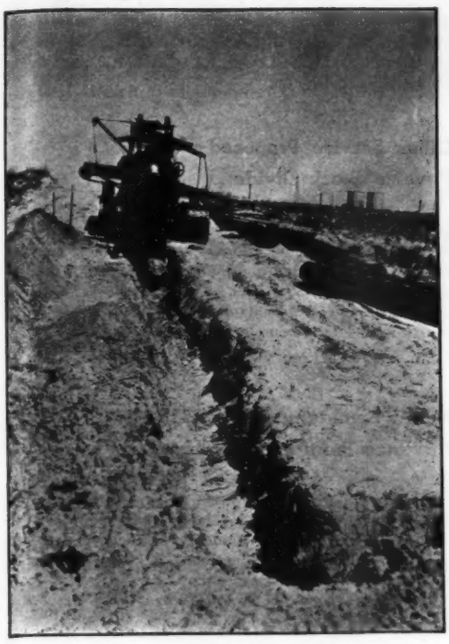
FORT WORTH, Tex.—United Gas Co. is preparing to lay about 10 miles of fuel lines throughout the K.M.A. field of North Texas to care for drilling and lease requirements.

Association to Study Cathodic Protection of Pipe Lines

HOUSTON, Tex.—As a result of increasing interest in the use of electrical drainage for preventing corrosion of oil and gas lines as well as other buried metallic structures an association has been formed to promote proper methods of installing this protection.



General view of Michigan Gas & Transmission Company's booster station at Montezuma, Ind.



Ditcher in sand dune area

The association will be known as the Mid-Continent Cathodic Protection Association. The association is a voluntary one composed of any and all companies or individuals interested in the cathodic protection of metallic structures. There are no membership fees. The main purpose is to determine the most satisfactory manner of notifying interested parties within the drainage radius of each cathodic protection unit. The affairs of the organization are handled by a committee of five composed of L. F. Scherer, Texas Co., chairman; Walter F. Rogers, Gulf Oil Corp., secretary; E. R. Cunningham, United Gas Pipe Line Co.; J. C. Stirling, Stanolind Pipe Line Co.; and O. C. Mudd, Shell Pipe Line Corp. A meeting is planned to be held in June.

Southern Natural May Buy Mississippi Gas Lines

Southern Natural Gas Co., of Birmingham, Ala., has filed an application with the S.E.C. for approval of the acquisition by purchase from Mississippi Power & Light Co., of Jackson, Miss., of three branch pipe lines extending from applicant's main line to Yazoo City, Kosciusko, Durant and Goodman, Miss., for $97,378.18. Southern Natural Gas Co. operates a natural gas line from the Monroe field in Louisiana to markets in Mississippi, Alabama, and Georgia.

Line From Miller County To Louisiana Plant

SHREVEPORT, La.—An 8-inch line from the Miller County, Arkansas, extension of the Rodessa field to its gasoline plant in the townsite area on the Louisiana side, is being completed by East Texas Refining Co. The line is expected to eliminate most of the gas wastage in the Miller area.

Union Producing Co. has contracted to purchase from the East Texas firm residue gas available, for its distribution system.

Humble Laying Parallel Line From Judkins to Odessa

FORT WORTH, Tex.—Humble Pipe Line Co. is increasing its facilities in Ector County, West Texas, to care for the growing production in the Harper and Foster pools. A 6-inch line is being laid parallel to its 8-inch line from the Judkins station to the Odessa station.

Refinery Expansion

Socony-Vacuum Agreement With Universal Oil Products

CHICAGO, Mar. 28.—Socony-Vacuum Oil Co., Inc., which operates 17 refineries in 10 states with world-wide marketing facilities, has recently purchased from Universal Oil Products Co. full operating rights under all of Universal's pyrolytic cracking patents. The price is understood to be several million dollars. Socony-Vacuum also acquires rights, conditionally, under other Universal patents as well.

The agreement was signed by President H. J. Haile for Universal, and by Vice President H. F. Sheets for Socony-Vacuum.

For many years Socony-Vacuum has been a licensee of Gasoline Products Co., possessing full rights under all of the cracking patents of gasoline products and its associated companies, including Standard Oil Co. of New Jersey, Standard Oil Co. of Indiana, and Texas Co. In cooperation with Sun Oil Co., Socony-Vacuum has spent some years in the development of the Houdry catalytic cracking process.

As a result of this contract, Universal's infringement suits in the U. S. District Court for the District of Delaware, against White Eagle Oil Corp., now a subsidiary of Socony-Vacuum, will be dismissed. The infringement suit was against White Eagle's Jenkins and Winkler-Koch operations. Other subsidiaries include Magnolia Petroleum Co. and General Petroleum Corp.

Ashland to Construct New Vacuum Distillation Unit

LOUISVILLE, Ky.—Plans for construction of a vacuum distillation unit to replace crude stills at its Ashland, Ky., refinery, have been announced by Ashland Oil & Refining Co. The unit will be of about 6,000 bbls. capacity and cost is estimated at $750,000, according to Paul G. Blazer, president.

California Motor Fuel Tax Receipts Higher in January

SACRAMENTO, Calif. — A return of the upward trend in gasoline sales in California was indicated during February, the State Board of Equalization reported. Sales for last month amounted to 118,823,511 gallons, on which a tax totaling $3,564,705 was assessed. This represented a gain of 2.48 per cent over that collected for the same month of the previous year.

Ten oil companies reporting the largest sales in February are listed as follows:

	Gallons actually sold	Net taxable gallonage
General Pet. Corp. of Calif.	24,181,117	10,930,071
Gilmore Oil Co.	5,242,680	117,109
Richfield Oil Corp.	15,509,384	12,500,860
Shell Oil Co.	25,948,528	13,345,509
Signal Oil Co.	4,639,519	.....
Standard Oil Co. of Calif.	52,164,699	15,579,056
Texas Co.	7,665,898	5,938,546
Tide Water Associated Oil Co.	17,807,504	10,360,726
Union Oil Co. of Calif.	20,777,304	11,072,938
Wilshire Oil Co., Inc.	7,244,224	7,033,182

Globe Installing Plant for Blending Lubricating Oils

Work on the construction of a new lubricating oil blending plant is now under way at Globe Oil & Refining Co.'s McPherson, Kans., refinery. A new building to house the plant is being erected. The company's refinery at Blackwell, Okla., is to remain shut down indefinitely and the company has transferred several families from Blackwell to McPherson.

Speakers for General Sessions Of Refiners Meeting Announced

The program for the general sessions at the twenty-sixth annual meeting of the Western Petroleum Refiners Association at Hot Springs, Ark., April 25, 26 and 27, was announced yesterday by A. V. Bourque, secretary-treasurer. Five men, nationally known in the business, industrial and professional world, will speak at the general sessions which will follow the technical program arranged by the manufacturing committee of the association. The five nationally known speakers, Mr. Bourque said, include B. C. Forbes, writer and commentator on business subjects; Glenn Griswold, vice president, McGraw Hill Publications; Whiting Williams, industrial relations counsel of international experience and Harvey T. Harrison, attorney of Little Rock, Ark. The fifth speaker will be announced later.

A change in the program for the technical sessions of the meeting, previously announced, has been made, Mr. Bourque said. A discussion of combination cracking units has been substituted for the Howard process. The new paper will be delivered by Dr. E. R. Smolley, petroleum engineer of the Lummus Co., Philadelphia, Pa.

New Michigan Refinery Placed in Operation

SAGINAW, Mich.—Bay Refining Co.'s new refinery at the mouth of the Saginaw River at Bay City, Mich., is scheduled to begin operations this week. Operators heated up the plant last week for a test, and all was pronounced ready for full operation. Approximately 20,000 bbls. of crude are stored at the refinery, ready for refining. The oil was transported through the Bay Pipe Line Co.'s new 33½-mile pipe line from the Buckeye field.

Hearing on Gasoline Weight For Rate-Making Purposes

CHICAGO.—An Interstate Commerce Commission hearing of a complaint against the accepted weight of gasoline for freight rate-making purposes was concluded last week after several oil companies joined railroads in opposing a weight reduction.

The commission heard the claim of oil jobbers associations that gasoline weighs 5.9 to 6 pounds a gallon, where the carriers, in setting transportation rates, have used 6.6 pounds a gallon as the established weight.

Companies whose traffic men testified were Phillips Petroleum Co., Skelly Oil Co., Mid-Continent Petroleum Corp., Socony-Vacuum Oil Co., Texas Co., Arkansas Fuel Co. and Standard Oil of New Jersey.

Natural Gasoline

Warren Petroleum Celebrates Sixteenth Anniversary

Warren Petroleum Corp. this month celebrated its sixteenth anniversary according to W. K. Warren of Tulsa, president, and as the year closed the company's natural gasoline and butane production had reached an all-time high. During 1937 the company shipped a total of 306,192,000 gallons of natural gasoline, an increase of 52 per cent over that shipped in 1936.

Plans Announced for New K.M.A. Gasoline Plant

Plans for the construction of a natural gasoline plant in the K.M.A. field near Wichita Falls, Tex., have been announced by Continental Oil Co. The plant will have a daily gas capacity of approximately 15,000,000 cubic feet, residue gas from the plant to be used for repressuring.

Deep Oil Development Co.'s 4,000,000-foot plant in Block 119, Archer County, is at present the only plant located in the field. Under construction, however, is the jointly-owned plant of Phillips Petroleum Co. and Sunray Oil Co. in the southwest extension of the pool.

EXPOSITION FOREIGN DELEGATES COMMITTEE

Seated: Joe H. West, Joe H. West & Co.; James H. Gardner, president Gardner Petroleum Corp., chairman of the committee; Miss Marie Rankin, Seismograph Service Corp.; Bruce H. Hariton, Amerada Petroleum Corp.; Glenn A. Campbell, Campbell Drilling Co. Standing: Max A. Jodeit, Worthington Machinery Corp.; G. H. Westby, Seismograph Service Corp.; Paul M. Raigorodsky, Petroleum Engineering Corp.; W. G. Green, Seismograph Service Corp.; William D. Morrer, Moorlane Co., and George F. Martin, Seismograph Service Corp., all of Tulsa.

"According to plans and negotiations by the Foreign Delegates Committee of the tenth International Petroleum Exposition with prospective foreign representatives to the May 14 to 21 oil show, approximately 20 to 25 nations will be represented in Tulsa," said Mr. Gardner.

Eastern District Program For Pittsburgh Meeting

The annual meeting of the eastern district of the division of production of the American Petroleum Institute will be held in the William Penn Hotel, Pittsburgh, Pa., April 14-15.

Thursday's technical session will start at 10 a.m. with F. E. Eckert, of Hanley & Bird, Bradford, Pa., presiding. The first paper will be on "Drilling and Operating Practices in Oriskany Sand Fields in Kanawha County, West Virginia," by O. W. Van Petten, superintendent, Columbian Carbon Co., Charleston, W. Va. "Public Relations in the Lease and Right of Way Department," by W. E. Ferguson, superintendent of lease and engineering departments, Ohio Fuel Gas Co., Columbus, Ohio, will follow.

Christy Payne, Jr., assistant to the vice president, Peoples Natural Gas Co., Pittsburgh, Pa., will preside in the afternoon when E. E. Roth, chief geologist, Columbia Engineering Corp., Pittsburgh, Pa., will discuss "Natural Gas Reserves in the Appalachian Natural Gas Province." The balance of the session will be devoted to secondary oil-recovery practice, and A. C. Simmons, president, Simmons Oil Corp., Bradford, Pa., will present a paper entitled "Recent Developments in Water Flooding." The second paper will be "Gas and Air Repressuring," by E. H. Tollefson, superintendent oil department, Hope Construction & Refining Co., Clarksburg, W. Va.

On Friday morning, April 15, D. T. Ring, geologist, Ohio Fuel Gas Co., Columbus, Ohio, will preside, and E. V. O'Rourke, associate professor, Ohio State University, will discuss "Will There Be Enough Oil?" C. V. Millikan, chief production engineer, Amerada Petroleum Corp., Tulsa, will discuss "Late Oil Production Problems in the Mid-Continent and Other Western Fields." J. C. Sionneger, chief engineer, Continental Supply Co., Dallas, Tex., has a paper on "Back Crank Problems and Rod Line Pumping."

The afternoon session on Friday will be presided over by J. J. Schmidt, general superintendent, field department, East Ohio Gas Co., Cleveland, and the first speaker will be R. W. McIlvain, Jr., manager, Illinois production division, Pure Oil Co., Olney, Ill., who will discuss "Oil Development in the Central Part of the Illinois Basin." "Oil Development in the Western Part of the Illinois Basin" will be reviewed by F. W. Freeborn, Jr., petroleum engineer, Adams Oil & Gas Co., Houston, Tex., and "New Kentucky Oil Fields" will be reported on by Iley B. Browning, geologist, Ashland, Ky. Dr. R. A. Smith, state geologist for Michigan, Lansing, Mich., will read a paper on "Geology of Michigan Oil Fields."

Interstate Compact Commission Meets at Wichita, April 29

AUSTIN, Tex.—Col. Ernest O. Thompson, chairman, has called a meeting of the Interstate Oil Compact Commission to be held April 29 and 30 at Wichita, Kans.

Amerada Will Test Block in Perry County, Illinois

Amerada Petroleum Corp. has acquired a block of leases from E. S. Adams on the Pinckneyville anticline in Perry County, Illinois, and has made a location for a test, 1,686 feet east and 330 feet south of NW cor. section 10-6s-3w, on which a well will be started soon.

Will Cut Runs in Bradford and Allegany Fields April 1

OIL CITY, Pa., Mar. 29.—The Bradford Transit Co., jointly owned by the South Penn Oil Co. and the Tide Water Associated Oil Co., and the largest gatherer of crude oil in the Bradford and Allegany fields in McKean County, Pennsylvania, and Cattaraugus and Allegany counties in New York, has notified producers in those field that, starting April 1, it will run crude from producers' tanks only to the quantity that each of the crude oil purchasers will agree to accept for immediate shipment.

The Bradford Oil Refining Co. and Quaker State Oil Refinery at Farmers Valley, Pa., had already announced that they would take less oil after April 1 from the Bradford field. The latter company set its April runs at 85 per cent of its January takings.

Committee on Elimination of Illegal Production of Oil

H. B. Fell, executive vice president of the Independent Petroleum Association of America, announces that the personnel of the association's committee on elimination of illegal production has been completed as follows: Judge Amos L. Beaty, chairman, Houston, Tex.; John Kilgore, vice chairman, Wichita Falls, Tex.; William P. D. Carey, Hutchinson, Kans.; W. P. McGinnis, Bartlesville, Okla.; Jeff Davis, El Dorado, Ark., and C. H. Lyons, Shreveport, La.

Cities Service Proposed Reverse Stock Dividend

NEW YORK, Mar. 29.—Stockholders of Cities Service Co. have been advised a proposed reverse stock dividend will be acted upon at the annual meeting in Dover, Del., next month providing for issuance of one new share of stock for each 10 old shares. There is no material change contemplated at present in the physical constitution of the company. The new stock will have a par value of $10, compared to no-par.

N.P.A. Semiannual Meeting Advance Program Announced

The advance program for the thirty-fifth semiannual meeting of the National Petroleum Association at the Cleveland Hotel, Cleveland, Ohio, follows:

Thursday, April 14—General session.

2. p.m. President's address. C. L. Suhr, president, National Petroleum Association.

"Foreign Affairs in Government and Trade," Prof. Henry M. Busch, Cleveland College.

"Aviation Today and Tomorrow," Jack Knight, United Air Lines.

"Measuring Public Opinion," Dr. George Gallup, director, American Institute of Public Opinion.

4 p.m. "Propane Treatment of Lubricating Oil Stocks."

7 p.m. Fellowship supper.

Entertainment committee: Canfield Oil Co., H. M. Carruth, A. L. Bailey; National Refining Co., C. S. Smith, H. W. Kuegler; Standard Oil Co. of Ohio, A. M. Maxwell, M. R. Bower.

Friday, April 15—Breakfast meeting.

10 a.m. Charles L. Suhr, president of the National Petroleum Association, presiding.

"Notes on the Early Pipe Lines," N. H. Weber, vice president, Pure Oil Co.

"As I See the Jobbers' Problems," Eric V. Weber, president, Ohio Petroleum Marketers Association and president of Eureka Oil Co.

"Class Consciousness in the Oil Industry," W. T. Holliday, president, Standard Oil Co. of Ohio.

Wednesday, April 13, 4 p.m.—Group meeting: Executive Committee, Fire and Safety Marshals.

8 p.m. Group meeting: Western Pennsylvania Refiners Traffic Meeting.

Thursday, April 14, 10 a.m.—Group meeting: (1) Board of Trustees Meeting; (2) Traffic and Transportation: Symposium on Railroad Consolidation; (3) Department of Taxation, Symposium on: (a) Corporation Income Tax; (b) Social Security Tax; (c) Miscellaneous Manufacturers' Excise Taxes.

4 p.m. Group meeting: Department of Manufacture. "Propane Treatment of Lubricating Oil Stocks." M. B. Cooke, Earl Petty and Paul Barton.

THE MARKETS*

CRUDE OIL: *Curtailments in refinery operations have reduced the current demand for crude oil, and latest reports show substantial additions to storage. Due to this situation efforts will be made to keep April production under March levels. Posted price schedules are steady, with no distress material offered in spot sales. California situation critical.*

REFINERY: *Most refining areas except California report improvement in gasoline situation with higher prices being maintained in the Mid-Continent. Slow movement in fuel oils. Lubricants weak.*

TANK-WAGON AND POSTED DEALER: *Posted dealer and service station prices advanced at many points due to higher freight rates effective March 28.*

FINANCIAL: *Common stocks of several oil companies broke to lowest levels in over three years. Average of 30 representative stocks for week ending March 26: High, 27.79; low, 24.18; close, 24.41. Week ending March 19: High, 28.9; low, 26.6; close, 27.3.*

*Detailed information in market section.

Certain Newer Aspects of the Michigan Basin

By DR. R. A. SMITH
State Geologist, Lansing, Mich.*

Our concept of the Michigan Basin is the result of nearly a century of evolution. The evolution is not yet complete. The process, however, has been more rapid in the past decade than for any previous period.

The thick blanket of glacial drift which nearly everywhere conceals the underlying rocks accounts for the slow development of the concept. Since the commercial discovery of oil and gas in Michigan in 1925 the records and samples from thousands of wells and test holes drilled incident to the development of this new industry have thrown great light on the structure of the basin. Large areas in the state, however, are still untested by the drill; hence completion of the concept must await further exploration in these portions of the state. It is a far cry from the simple and very restricted basin conceived nearly 100 years ago by Dr. Douglass Houghton, the first state geologist, and the complex but still imperfectly known geosynclinal basin of today.

Doctor Houghton applied the term "basin" to the Pennsylvanian coal-bearing strata in the central portion of the Southern Peninsula, but did not at first suspect that the term is more properly applicable to the other underlying Paleozoic formations. The Coal Basin rocks, except in the numerous local basins of deposition, are more horizontal than inclined toward a common center, as is the case with the underlying formations. Apparently the sinking movement in the Michigan Basin had largely ceased with beginning of Pennsylvanian time in Michigan.

Doctor Houghton's sketch map indicates a surprising knowledge of the general distribution of the coal-bearing series, but his earlier conceptions of the general structure, distribution and correlations of underlying Paleozoic formations were seriously in error.

About 1854 Dr. Alexander Winchell began a detailed study of the Paleozoic rocks of the state. In 1864 he made the first geological map of the entire state. That map shows the general form and extent of the Michigan Basin, the distribution of the rock formations in concentric belts, though rather diagrammatically, and indicates clearly Doctor Winchell's understanding of the basin-like structure. While he discovered the now oil-bearing anticline at Saginaw, and appreciated its oil and gas possibilities, none of his several geological maps of the state indicate that he visualized folding as characteristic of the Michigan Basin. The next great advance in our understanding of the structure of the Michigan Basin was made by Dr. A. C. Lane, who, in 1893, published a geological map of the Southern Peninsula of Michigan. The distribution of the rock formations are indicated more accurately than in Doctor Winchell's first or later geological maps of the Southern Peninsula. Doctor Lane's map was accompanied by numerous cross-sections which show the presence of considerable folding or warping in the Southern Peninsula.

Outline geological map of Michigan, showing Paleozoic formations and the location of deep borings

PENNSYLVANIA: (I.) Saginaw formation (Upper Pottsville) and Parma sandstone (Lower Pottsville). MISSISSIPPIAN: (II.) Grand Rapids Group: Upper Grand Rapids, Bayport or Maxville limestone (Upper St. Louis)), and Lower Grand Rapids of Michigan Series. (III.) Marshall Formation: Kinderhook of Iowa, Black Hand and (Logan of Ohio). Upper Marshall or Napoleon and Lower Marshall. (IV.) Coldwater Shale and Berea Sandstone. DEVONIAN: (V.) Antrim Shale. (VI.) Traverse Formation: (Hamilton and Marcellus Erian and Delaware of Ohio). (VII.) Dundee limestone. (Corniferous and Schoharie, Ulsterian, and Upper Helderberg). SILURIAN: (VIII.) Monroe Formation: Upper Monroe or Detroit River Series, Middle Monroe or Sylvania, and Lower Monroe or Bass Island Series. (IX.) Niagara, (Guelph and Lockport), Rochester shale and Clinton. ORDOVICIAN (X.) Richmond and overlying Medina of the Silurian, Lorraine and Utica. (XI.) Trenton limestone: (Galena and Platteville?). (XII.) St. Peters and Calciferous (Lower Magnesian). CAMBRIAN: (XIII.) Lake Superior or Potsdam sandstone. After Fig. 2, Pub. 14, Geol. Series 11, Mich. Geol. & Biol. Surv. 1912, The Occurrence of Oil and Gas in Michigan by R. A. Smith.

Between 1893 and 1909 Doctor Lane discovered several anticlinal folds, chiefly around the sides and in the marginal areas of the basin in the Southern Peninsula. Doctor Winchell's concept of a simple geosynclinal basin developed into one characterized by side and marginal folds with roughly radial axes.

Between 1911 and 1914 I made a restudy of the available data bearing on structural conditions in the basin and also made a sketch map of the then few known anticlines in the state. As may be inferred from this sketch, no evidence was found in the center of the basin. About 1921 Dr. W. I. Robinson, of the State Geological Survey, agreeing with the concept of radial folding, indicated on some unpublished maps the presence of terraces on the side of the basin. Recent studies by E. A. Newman, of the survey staff, corroborate Doctor Robinson's discoveries. In 1926 I had the fortunate opportunity to study a large number of confidential records of salt wells in the central area of the basin. These showed the presence of pronounced anticlinal folds extending in a northwest-southwest direction across the center of the basin.

A test well in Midland County drilled a few miles east of Mount Pleasant, in 1929, proved one of the anticlines to be commercially productive of oil. This started an orgy of wildcat exploration over the whole central area of the Southern Peninsula. A study of the resulting many well records by Dr. R. B. Newcombe, of the state survey, disclosed the presence of a number of par-

*Before American Association for Advancement of Science, Indianapolis, Ind.

allel trends of folding, not only in the center of the basin but in much of the interior portion of the Southern Peninsula. The discovery of this system of parallel folding was one of the most important since Doctor Winchell's day.

The discovery of numerous fields of oil and gas along several of these anticlinal folds resulted in still more widespread exploration which revealed other trends of folding farther and farther from the center of the basin. These folds also had the same general northwest-southeast direction. The evidence indicated that there were at least six major trends of parallel folding 100 or more miles in length, and a number of minor trends, and that further exploration probably would show the presence of similar folding in the structurally unknown northern and southwestern portions of the Southern Peninsula.

In the Muskegon oil field on the west side of the peninsula the main axis of the anticline is nearly east-west, suggestive of radial folding, but across the east end of the structure there is a significant northwest-southeast cross fold, so pronounced that it gave rise to two very small but commercially important pools of oil. A year ago evidence from wells in Allegan and Berrien counties indicated the presence of radial rather than northwest-southeast folds. This evidence, and the apparent dominance of radial folding at Muskegon and in southwestern Michigan were indicative that the parallel folds of the central part of the basin would be progressively weaker west, southwest, and south, toward Lake Michigan and northern Indiana.

The Salem Township oil field in Allegan County, southwestern Michigan, was discovered in February, 1937. A recent study of the field resulted in the surprising discovery that this field lies along an anticline having a northwest-southeast trend, or opposite that for radial folds in southwestern Michigan. Still more recent drilling in Allegan County has revealed the presence of two other folds apparently with the same general northwest-southeast axes. The last evidence thus indicates that the northwest-southeast trends of folding will be found dominant over any radial folding which may exist in southwestern Michigan.

Exploration on the other side of the state in the northeastern quadrant, in Ogemaw, Iosco, and other counties, has shown the presence of strong anticlinal folds having the same general northwest-southeast trends as in the central area and in Allegan and Berrien counties. Scattered drilling in the extreme northern and northeastern portions of the Southern Peninsula are also suggestive that the same type of folding will also be found characteristic of that part of the state.

In the eastern Paleozoic half of the Northern Peninsula wells are so scattered that there is little evidence of folding except on Seul Choix Point, Schoolcraft County. The axial direction of the Seul Choix Point anticline is northwest-southeast. Since the fold is in the northwest quadrant of the Michigan Basin, the axial direction of both radial and northwest-southeast folds should be similar; hence the evidence is not conclusive.

The parallel trends of northwest-southeast folding are so pronounced and widespread in Michigan, and of such great length, that they seem to be explained only by the assumption that an orogenic force compressed the Michigan Basin from northeast to southwest.

The great area known to have been crumpled is suggestive that the region affected by this force may extend far beyond the boundaries of Michigan. While the evidence is not conclusive, it is very suggestive that northwest-southeast trends of folding may be found in Indiana and perhaps in Illinois. Since these folds largely control the accumulation of oil and gas in Michigan, the possibility for the presence of such structures in northern Indiana and northeastern Illinois warrants further study and consideration.

South Texas Jubilee at San Antonio

SAN ANTONIO, Tex.—On April 8 oil men from several states will gather to participate in the South Texas Oil Men's Jubilee. The occasion will have the dual purpose of honoring O. W. Killam of Laredo and bringing together new operators of South Texas.

Fig. 2—Outline geological map showing trends of anticlinal folding.—Geological Survey Division, Department of Conservation, Michigan
Fig. 3—Showing structural contours drawn on the top of the Traverse formation and axial lines of anticlinal folds. After Plate III, Pub. 38, Geol. Series 32, Mich. Geol. Surv. Div., Dept. of Conservation, 1933, The Oil and Gas Fields of Michigan, by R. B. Newcombe

Use of Drilling Time in Determining Completion Practices—Goldsmith Pool

By MAX DAVID
Landreth Production Corp.

Drilling time on rotary wells is being used to advantage by many operators in the Permian Basin. For example, drilling time is helpful in determining certain completion practices, such as the selection of casing seats, manner of acidization, shot positions, and the determination of total depths. Corrective work is likewise made easier. Plug-back depths, packer seats, and casing perforation zones, may in part be determined by drilling time. Due to the variations in the hardness of different formations, drilling time has proved to be a valuable correlative aid, and in the pay section in dolomitic limestone it can be used for the relative evaluation of properties.

It is the purpose of this paper to demonstrate the value of drilling time in the interpretation of the pay section of dolomitic limestone reservoirs. Other practical applications will be illustrated. All examples are taken from the Goldsmith pool, Ector County, Texas, which may be considered typical of dolomitic limestone reservoirs in the Permian Basin.

Drilling Time Procedure

Drilling time may be defined as the time required to drill a certain interval. One-, two-, five-, and ten-foot intervals may be used; however, 1-foot intervals in the pay section give a more detailed picture. The kelly is marked off with paint according to the desired interval. The time is recorded as each mark reaches the rotary table, and the number of minutes required in drilling the interval is determined. Each mark on the kelly corresponds to the present drilling depth. Ordinarily, the driller has one of his helpers take care of the drilling-time record.

The drillers are asked to maintain a constant weight on the drill stem and to rotate at an even speed. Usually, five to six points less than the pick-up weight is carried on the drill pipe and a rotary speed of 50 to 60 revolutions per minute is maintained.

Mechanical difficulties in some cases will interfere with the results and accuracy of the drilling-time record. Junk or loose iron on the bottom of the hole, or a locked cone on a bit will naturally result in slow drilling, regardless of the hardness of the formation. Even with certain human and mechanical factors, drilling time is a good indicator of porous and nonporous dolomite.

Description of the Pay Section in the Goldsmith Pool

Like many other pools in the Permian Basin, the reservoir rock in the Goldsmith pool is dolomitic limestone. The pay zone may be divided into two parts, the upper pay or the white crystalline zone and the lower brown anhydritic zone. The two zones cover a stratigraphic thickness of some 250 feet. Free gas caps exist in the field and the gas-oil contact at present is found at a subsea datum of approximately 980 feet. Oil is found in both zones, depending upon structural position. High structural wells find the white crystalline zone filled with gas and produce entirely from the brown anhydritic zone. Low edge wells find the pay in the first porosity in the white crystalline zone. The best producers are those wells so structurally situated that they encounter the white zone porosity at the gas-oil contact.

More porosity and permeability is found in the white zone than in the brown anhydritic zone. The brown zone possesses considerable amounts of secondary minerals, such as calcite, anhydrite, and even sulfur. In some parts of the field anhydrite and calcite are found replacing the porosity in the white zone.

In the gas caps in the pool, the oil string is cemented at or a few feet below the gas-oil contact. Only one rotary bit is required to drill the plug and drill in. Drilling-in fluids used are either oil, clear water, or mud.

Comparison of Porosity and Drilling Time

A comparison of the porosity found in cuttings and cores of dolomite with drilling time reveals that fast drilling time usually conforms to the best porosity. By recording the drilling time required to drill individual intervals of 1 foot, it is possible to determine exactly the number of feet of porous dolomite drilled, and secure a fair idea as to the quality of the porosity. Conversely, the nonporous zones drill slowly. Well cuttings and cores should be microscopically analyzed to check the drilling time, at least until definite relations are known to exist between the two.

For this study, drilling time of the pay section was recorded for each foot drilled. It has been found that on the average, when the drilling time requires more than 10 minutes to drill 1 foot, there is little effective porosity. Six- to ten-minute drilling time indicates slight porosity, three to six minutes indicates fair porosity, and less than three minutes suggests very good porosity. This relative classification works well in the Goldsmith pool, however, it may vary with other limestone fields, depending upon the nature and character of the reservoir rock.

Porosity percentages of cores recovered compared with drilling time show that the following table represents fair averages:

Time in minutes—	Average porosity (per cent)
10 or over	0– 3
6 to 10	3– 5
3 to 6	5–10
1 to 3	10–20

***A.P.I.*—Before Spring Meeting of Division of Production, Fort Worth, Texas, March 24-25**

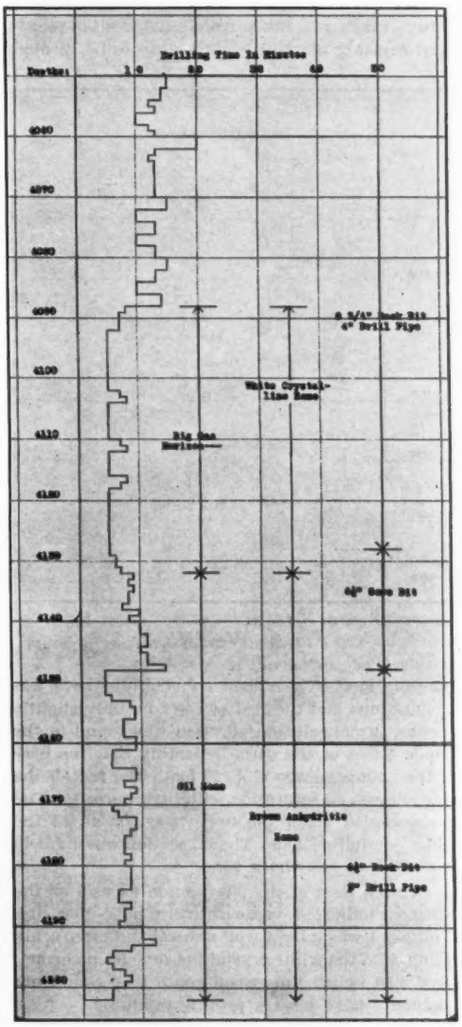


Fig. 1—Well No. 1

The deposition of secondary minerals, such as gypsum and calcite, reduces the porosity and permeability of the rock. Since minerals like gypsum are drilled rapidly, fast drilling time under such conditions does not reflect their actual lack of porosity. It is well to examine the samples in such cases.

Core recovery in very porous crystalline dolomite is usually poor. The most porous parts of the white crystalline dolomite are crumbly due to their extreme crystallinity and have a tendency to wash away during coring. In cases where there is no core recovery, but the drilling time is very rapid, it is safe to assume that the formation has a high percentage of porosity. The core recovered usually represents the less porous portion. From this standpoint, drilling time gives better information than ocring when little if any recovery is secured.

Determination of Porous Zones on a High Structural Well

Well No. 1, Figure 1, shows the plotted drilling time on a high structural well. The drilling time was recorded under different drilling conditions as shown by the notations. From 4,050 to 4,128 feet, an 8¾-inch rock bit and 4-inch drill pipe was used; from 4,128 to 4,148 feet coring was done with a 6¼-

inch hard rock core head; and from 4,148 to the total depth, 4,202 feet, a 6¼-inch rock bit with 3-inch drill pipe was used. Thus the drilling time was tested under various drilling conditions.

At 4,090 feet the "big gas" porosity was encountered in the top of the white crystalline dolomite. A core was taken from 4,128 to 4,148 feet to find a casing seat sufficiently deep to be through

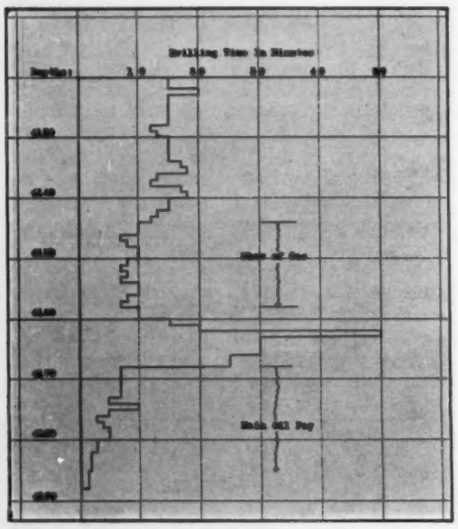


Fig. 2—Well No. 2

the "big gas." The upper 4 feet of the core was very porous and the rest of the core only slightly porous. Practically no oil stain was found in the upper 4 feet of the core, indicating that the base of the "big gas" was at 4,135 feet. The rest of the core showed oil saturation with little porosity. The gas occupied all of the upper pay, or all of the white crystalline zone. The oil section was entirely in the brown anhydritic zone.

Drilling time of the pay section as well as the cuttings indicated comparatively poor porosity. Well No. 1 was a light well natural and after acidization. Had the white crystalline zone been encountered just below the gas-oil contact, it would undoubtedly have been a prolific producer.

Determination of Porous Zones on a Low Structural Well

Well No. 2, Figure 2 shows the drilling time on an east edge well in the Goldsmith pool. The oil string was purposely set high on this location as the well was out of the free gas area. Slight porosity with no oil stain was found in the cuttings from 4,150 to 4,160 feet. The drilling time indicated some porosity here and it proved to be a slight show of gas. The main porosity or pay was encountered at 4,170 feet as shown by the drilling time. Samples showed the best porosity to be in the last 10 feet drilled. The drilling time checks in this respect. Due to the low structural position of the well, only a few feet of the pay was drilled. Drilling time alone could have been used on this well to determine the top of the pay and how much was being drilled, however, it is always well to check the drilling time by microscopic examination of cuttings.

Comparison of Drilling Time and Well Potential

Wide variations in well potentials are typical of limestone reservoirs. This is unquestionably the result of erratic developments of porosity and permeability. Variations in well potentials, especially between offset wells, are often a matter of concern. Variation of well potentials in the Goldsmith pool are attributed to the amount of porosity as shown by drilling time of the pay section.

Comparison of Offset Wells

Wells Nos. 3 and 4, Figures 3 and 4 show offset wells on the same lease, 770 feet apart. As the drilling time indicates, well No. 4 was a much better well with respect to porosity than well No. 3. Both wells were treated with 5,500 gallons of acid in two stages. Well No. 3, tested at the rate of 1,900 bbls. a day and well No. 4, had a potential capacity of 2,700 bbls. Well No. 4 had 77 feet of penetration, all of which was porous as shown by drilling time. Well No. 3 had 70 feet of penetration, of which 52 feet was porous as shown by drilling time. Well No. 3 had 37 bbls. potential per porous foot of pay whereas well No. 4 had 35 bbls. per porous foot of pay.

Comparison of Wells Some Distance Apart

Well No. 5, Figure 5, had a very soft pay section. Drilling time shows that the porosity was vertically continuous. Well No. 5 was good for 30 bbls. an hour naturally and acidized into an 1,800-bbl. well after being treated with 5,000 gallons of acid administered in two treatments.

Well No. 6, Figure 6, is 1½ miles from well No. 5, but in the same relative structural position. Well No. 6 had a greater penetration of the oil section than well No. 5, however, it was a light well as might be suspected by the slow drilling time. The best porosity was in the bottom 13 feet. After being treated three times with a total of 6,500 gallons of acid, it was good for only 650 bbls. per day.

In comparing wells Nos. 5 and 6, well No. 5 has 43 feet of soft pay section and a potential of 1,800 bbls., 1 foot of pay being equivalent to 41 bbls. potential. Well No. 6, with only 13 feet of medium soft pay section and a potential of 650 bbls. or 1 foot of pay to 50 bbls. potential. The discrepancy between the two wells on a footage potential basis

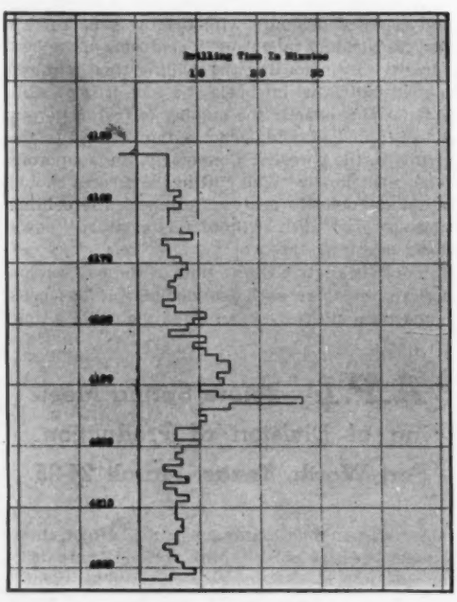


Fig. 3—Well No. 3

is not great, and may be explained by the fact that well No. 6 was given an additional 1,500 gallons of acid or that there is some pay in the hard dolomite considered to be lacking in porosity.

Estimation of Relative Property Values by Drilling Time

It is believed there is a distinct relationship between the hardness of the pay section and well potential. Likewise, there is no doubt that there is more oil per acre-foot under the leases having very porous pay zones as shown by drilling time. From the standpoint of recovery, wells having soft pay sections, which indicates high percentages of porosity, should recover more oil than a well possessing a tight porous condition in the same structural position. While it is true that difference in

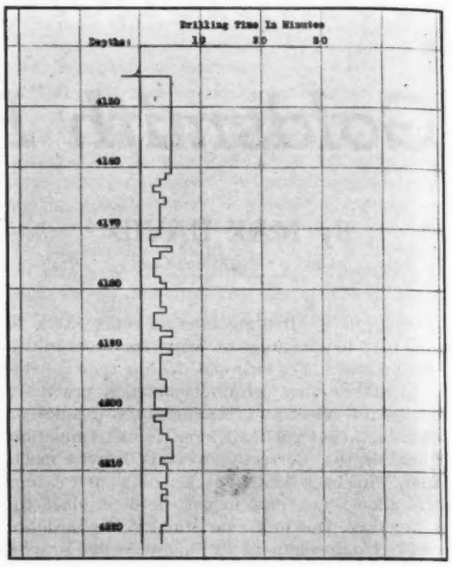


Fig. 4—Well No. 4

porosity may exist a few feet away from the bore hole, a study of the drilling time on all wells on a lease should result in a relative accurate average of porosity.

Ultimate recovery from limestone reservoirs is difficult to estimate with any degree of accuracy by the volumetric or oil in place method, on account of the lack of information regarding percentages of porosity. With accurate drilling time, the proper assignment of porosity percentages to equivalent drilling time, and the construction of bottom water maps, it is believed that the volumetric method of estimating ultimate recovery in limestone fields still has great possibilities. While the degree of accuracy attained in estimating recovery by the volumetric method in sand production cannot be made, a better degree of accuracy can be realized by the proposed method. To reach a higher degree of accuracy, more accurate and detailed information than heretofore obtained must be secured during drilling.

Use of Drilling Time for Completion Practices

(a) Selection of casing seats from drilling time.

Well No. 1, affords a good example of how drilling time may be used to advantage in determining casing seats by drilling time. The hard zone separating the gas and the oil afforded a relative impervious bed for the casing seat. Well No. 2 had a very hard zone from 4,160 to 4,169 feet which would have been an ideal casing point had there been too much gas above this zone.

(b) Determination of total depths by drilling time.

The determination of total depths in limestone reservoirs should be based on reasonable penetration of the pay zone without drilling too near bottom water. There are two points of view regarding total penetration in limestone. The first is to stop the well on a hard shell and the second is to stop in the top of a porous zone with practically no penetration into the porous zone.

The total depth of a well should be determined with reference to the bottom water level. Stopping

on a hard shell in the Goldsmith pool, assuming reasonable penetration, offers two distinct advantages, namely some protection against the eventual encroachment of bottom water and the safeguard of possible acidization into water. One disadvantage of this procedure is that there may be an additional oil pay below the hard shell, however, there also might be water in the next porous zone. Stopping in a porous zone offers the probable advantage of recovering nearly all of the oil present in the zone down to the next hard shell. If both oil and water are present in this zone, the chances are the water will cone and the well will make water early in its life.

In the Goldsmith pool, it is believed that there is a definite advantage in stopping wells on shells if they are present and are found not more than 20 feet above the known water level. In cases where the porosity is continuous to the water table, it is best to stop the well relatively high to avoid premature water encroachment.

(c) The importance of studying drilling time before acidizing.

Acid when properly controlled increases the rate of oil production in the Goldsmith pool. The two hazards of acidization are increasing gas-oil ratios and treating into water, which are usually caused by the attempt to treat with acid at too fast a rate, thus building up pressures so high that control of the acid is lost. Sometimes the treatment is made by following out instructions that were developed without a careful study of well conditions. When high pressures are required to inject acid into the well, it has low permeability and the acid should be pumped in at a slow rate to allow it to increase permeability immediately around the bore hole before attempting to force the acid out into the formation. When acid is pumped in the well at too high rates, control is sometimes lost and the acid is forced up into the gas zone, resulting in high gas-oil ratios. Improper acid treating technique could in part be remedied by a careful study of drilling time and well conditions before attempting the acidization process.

Drilling time of the pay section and above the casing seat, plus the natural production information will give the operators some good ideas as to porosity conditions and the general problems and dangers of acid treating. Wells in which the total depth is in soft pay and relatively close to the water level, can easily be acidized into bottom water when no seal is placed in the bottom of the hole. As mentioned above, the danger of acidizing into bottom water is eliminated by stopping the wells on hard shells providing they can be found at reasonable depths above the water table.

(d) Determination of shot positions.

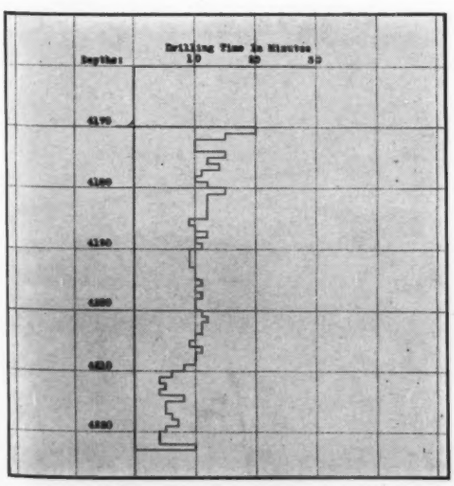


Fig. 5—Well No. 5

Nitroglycerin shots are too often placed in wells with little or no knowledge of the depths and thicknesses of the porous zones. Shooting of impervious limestone beds does not increase production and may impair the bore hole for future remedial work, such as the running of packers and liners.

Drilling time will furnish the operator with a knowledge of the formation so that the shot may be placed opposite the porous zones. Higher increases in production should be realized with such a procedure.

Use of Drilling Time for Remedial Work

(a) Plug-back jobs.

Due to the porous nature of the reservoir rock in the Goldsmith pool, plug-back jobs are usually not successful until the plug-back material comes up the hole to an impervious shell. This is caused by water leaking around the plug.

Well No. 7, Figure 7, was acidized into bottom water during the second acid treatment. An effective shut off was not secured until the hole had been plugged back to the hard shell indicated by the drilling time at 4,210 feet. Due to the apparent vertical porosity present below this hard shell, water intrusion continued until the lead plug was built up to the impervious shell. Had it been known that this condition would continue, one cement "squeeze" job up to the hard zone at 4,210 feet would probably have secured a shut off easier and with less expense.

(b) Packer seats and liners.

Information may be gained from drilling time

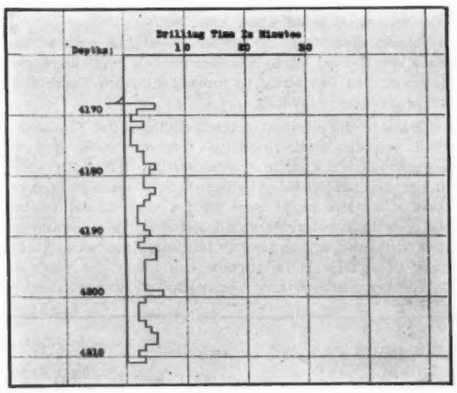


Fig. 6—Well No. 6

to pick the point where packers and liners should be set to secure lower gas-oil ratios. Packers give better results when they are set on hard shells which separate gas and oil horizons. The information for selecting packer seats may be used for selecting casing points. Well No. 2, Figure 2, shows how drilling time could be used in selecting a packer seat. Had there been too much gas in the formations above the hard shell from 4,160 to 4,169 feet, the logical position for a packer seat would have been opposite the hard shell shown by the drilling time.

(c) Pipe perforations.

There is sufficient gas dissolved in the oil in the Goldsmith pool at present to flow practically all the wells, however, other lifting agents will be resorted to in later years of the pool's life. In the free gas-cap areas, perforation of the pipe opposite the gas zones will furnish energy for lifting purposes.

Summary and Conclusions

Drilling time provides supplementary information on rotary wells. With the elimination of guess work, more and well defined drilling supervision, and a greater use and development of auto matic recording devices on rotary rigs, drilling time appears to hold great possibilities for improved geological and engineering data.

Drilling time is applicable to other areas in

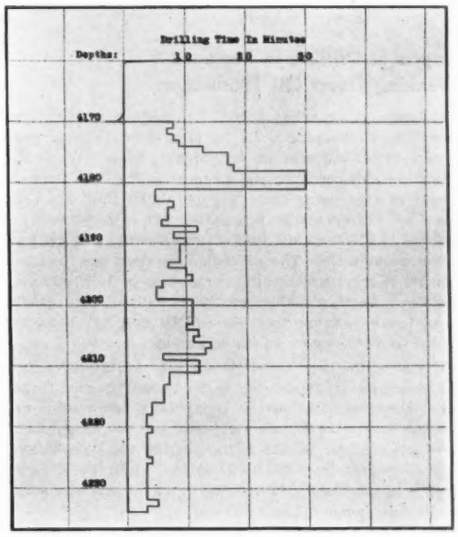


Fig. 7—Well No. 7

addition to the Permian Basin dolomitic limestones. Its applicability to formations other than limestone are not known to the writer, but warrants careful testing.

From the standpoint of cost, drilling time represents the cheapest kind of well information.

Acknowledgments

The writer is grateful to the Landreth Production Corp., Fort Worth, Tex., for the privilege and permission to make this study public. The efforts and cooperation on the parts of the Arrow Drilling Co. of Tulsa, the Olson Drilling Co. of Tulsa, E. B. Gooden Drilling Co. of Tulsa, and the E. C. Norwood Drilling Co. of Wichita Falls, Tex., were appreciated by the writer and his company. Particular thanks is due Addison Young, Landreth Production Corp., Midland, Tex., and E. A. Wahlstrom, Goldsmith pool engineering committee, Midland, Tex., for their interest, constructive criticism and suggestions.

Michigan's Right to Minerals on Homesteaded Land Upheld

SAGINAW, Mich.—The state's rights to coal, oil, gas and other mineral rights in several million acres of homestead lands were upheld in an oil royalty suit in Gladwin County, scene of the rich Buckeye oil field and of the promising new Bentley pool.

The decision by Circuit Judge Neil E. Reid of Mount Clemens, held constitutional a 1909 act of the legislature reserving to the state all mineral rights in homestead lands, though it was in possible conflict with the 1893 statute providing that homestead deeds "shall convey an absolute title to the lands sold." The decision set up the dictum that homesteaders' rights are surface rights alone.

The case arose over royalties on oil produced on an 80-acre tract of homesteaded land in the discovery section of the Buckeye field. Several oil companies were lessees, with the state as lessor, and the holder of the homestead deed, Mrs. Lena L. Rathbun, sued the oil companies to collect the royalty they had been paying to the state. About $100,000 in royalties was impounded during the litigation, in which the state intervened as a defendant. Judge Reid said in his opinion that to rule otherwise would create "almost indescribable confusion and result in ceaseless and interminable litigation."

INTERNATIONAL NEWS

Japan Is Drilling in Formosa Seeking Deep Oil Production

Japan is entering a bid for deep production in Formosa in keeping with its intensified drilling program in all national or territorial prospective areas. Near the close of last year, a report to the U. S. Department of Commerce from Tokyo related that one test well in Formosa was proceeding below 3,486 metres (about 11,435 feet) and that several showings of gas had been encountered. The exceptionally deep test was included in a report showing completion of 12 producers between April and October, 1937, with daily average production ranging from 30 to 300 koku (1 koku is equal to 47.65 American liquid gallons).

Nine of the new completions are in Akita Prefecture of Japan proper, four being in the Yabase district, three at Omonogawa and two at Innai. Only one well is reported from the Niigata field and the remaining two are in Formosa. In the Akita district, the completion depths ranged from 950 to 2,950 feet while the Niigata well was finished at 2,600 feet. One of the Formosa wells was completed at 3,550 feet.

During the first seven months of 1937, Japan produced 1,429,600 bbls. of crude oil. Since July, all information on crude oil production, refinery throughput and other similar information has been suppressed in Japan because of the Chinese campaign. Japan has adopted several gasoline and fuel oil conservation measures intended to reduce use by civilians to a minimum.

A summary of the Imperial Fuel Board's rulings follows: "1. In parallel with the establishment of a permanent oil production increase plan, the gasoline import capacity should be expanded by the proper operation of the financial and economic policy to meet the pressing need. Proper control should be exercised over the imports so that the movement of imported gasoline should be supervised from the arrival to the consumption.

"2. The rationalization of the distribution system with the oil refiners association (Sekiyu Rengokai) at the helm is to be accelerated. Differences in gasoline prices should be composed by the unification of the standard of gasoline.

"3. As to the consumption control measure on a small-scale, the adoption of the meter system by the taxi circles, the largest gasoline consuming group, is to be accelerated and the cruising of taxis on streets is to be prohibited."

Socony-Vacuum is Granted Contract in Philippines

A proposal of Socony-Vacuum Oil Co., Inc., to explore portions of the Philippine Islands for oil production has received the support of President Manuel Quezon. Approval of a contract with Socony-Vacuum for exploration of 13 Philippine provinces was urged on the National Assembly at Manila by President Quezon recently.

Under the reported terms of the contract, Socony-Vacuum would undertake to explore the alloted land at its own expense, the agreement to be binding for 25 years with provision for renewal for another 25 years. If production is obtained the Philippine government would retain 12½ per cent of the gross output until the yield reaches 2,000,000 bbls. annually and above that amount 20 per cent.

East Central Venezuelan Field Begins Shipment of Its Product

East central Venezuela, including the southern portions of the states of Monagas and Anzoategui, held by some observers to be the world's next large oil field, advanced to the shipping stage the middle of last month. Only the Temblador field in the southern part of Monagas currently figures in active production, but there have been other discoveries of equal or greater importance in the general territory, which has been under exploration for several years.

Exploratory drilling reached all-time record proportions in 1937 resulting in sufficient production in the Temblador field to justify construction of a pipe line outlet to water transportation arteries. Several months have been required to build docks, lay the 32 miles of 10-inch pipe line from the field to Boca de Unocoa, install pumping facilities and to make other necessary arrangements for shipping crude.

The first cargo of Temblador field crude was lifted from Boca de Unocoa, consisting of 19,000 bbls. of 23° A.P.I. gravity oil on February 16. The shallow draft tankers will move the oil from Boca de Unocoa north through the Unocoa River, the Gulf of Paria to Guiria for trans-shipment to Aruba or from the Gulf of Paria west through the San Juan River to Caripito for processing there.

At the end of the third week in February only four Temblador field wells had been tied into the 10-inch pipe line, but gathering lines are being extended to other completed wells and production available for shipment will probably increase shortly above the present rate of 4,200 bbls. daily.

Installation of an 80,000-bbl. receiving tank at the Boca de Unocoa pipe line terminal is well advanced and will add flexibility to movement from Temblador not currently available.

Many of the physical characteristics of the Temblador field remain undisclosed to the operators due to meager exploration and exploitation but with shipments started it is anticipated that work will proceed at a more rapid pace with a view to delineating the productive territory. In general, the Temblador field and most of the nearby territory is a broad plain. Lack of relief on the surface has made the work of exploration in eastern Venezuela a time-consuming task with geologists compelled to lean heavily on geophysical results. Drilling is just now reaching the stage where subsurface study can be made with some degree of assurance.

U.S.S.R. Petroleum Exports In January Declined

Petroleum exports from U.S.S.R. continued to seek a new low in January. Reports from the Bureau of Foreign and Domestic Commerce offices at Istanbul, the port through which practically all Soviet petroleum exports move, show shipments totaling 65,505 metric tons for January compared with 195,205 tons in January, 1937. Gasoline exports increased more than 1,000 metric tons, but all other products declined as shown in detail below:

Products—	January 1937	January 1938
Lubricating oil	28,488	25,609
Fuel oils	111,054	6,343
Kerosene	23,408	.....
Gasoline	32,255	33,553
Total	195,205	65,505

Indicative of the decline in petroleum exports from the U.S.S.R. during the past five years is a recent special report from the United States' commercial attache office in Istanbul, Turkey, the port through which most Russian foreign shipments pass in leaving the Black Sea.

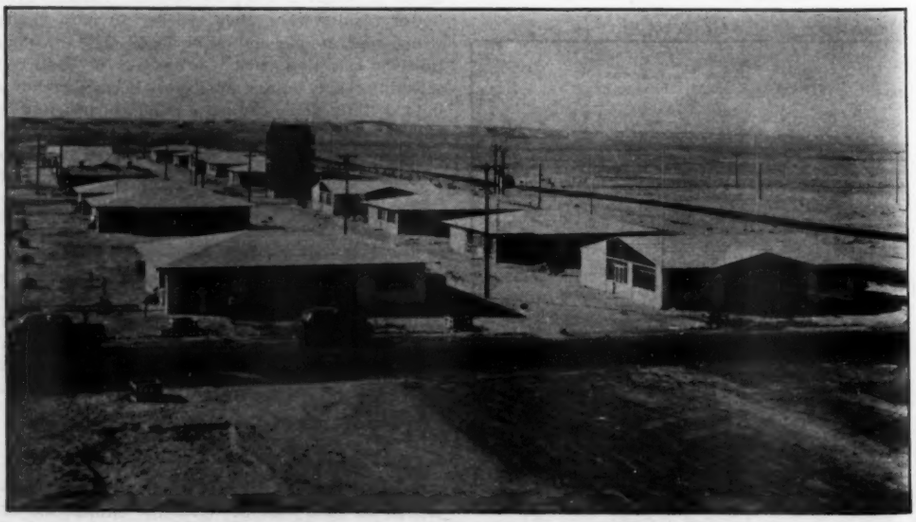
Since 1933 when petroleum exports passing Istanbul totaled 4,377,323 tons, the decline has been uninterrupted. The rate of decline was by almost 50 per cent in 1937 when the smallest total of the five-year period was registered. From total petroleum exports of 2,516,850 tons in 1936, the shipments dropped in 1937 to 1,552,726 tons.

The decline of exports has been spread over practically all products, but lubricating oil shipments have come nearer a straight line than any other product. The most pronounced declines have been in fuel oil and gasoline with kerosene, paraffin and asphalt also slumping.

The following table shows the export record of petroleum from Black Sea ports passing Istanbul for the past five years:

(Figures in metric tons)

Products:	1933	1934	1935	1936	1937
Fuel oils	2,190,012	1,893,492	1,617,407	1,254,730	741,554
Gasoline	1,387,659	1,331,010	895,425	630,524	434,287
Kerosene	507,480	436,896	400,902	297,388	163,887
Lube oil	258,117	254,812	345,488	327,024	212,998
Paraffin	.....	8,848	1,150	808	.....
Asphalt	54,055	193,949	33,572	6,376	.....
Total	4,377,323	4,129,007	3,294,943	2,516,850	1,552,726



Portion of an air conditioned camp on Bahrein Island

REFINING IN 1938

PETROLEUM *refineries in the United States will process in 1938 approximately one and a quarter billion barrels of crude oil. In carrying on these operations 450 active plants will employ more than 200,000 men. These workers, as in 1937, will receive the highest wage scales paid by any industry, with a minimum of seasonal layoffs. In the great majority of cases they will have regular employment throughout the year, and vacations with pay.*

Despite a general business recession, the operations of these plants will exceed those of the previous peak year of 1937. There will be small reductions in the demand for some products, but others are expected to exceed previous yearly totals.

This year's operations will produce:

590,000,000 barrels of gasoline
66,000,000 barrels of kerosene
150,000,000 barrels of gas oil and distillate fuels
320,000,000 barrels of residual fuels
37,000,000 barrels of lubricants
500,000,000 pounds of wax
1,400,000 tons of coke
4,500,000 tons of asphalt
8,000,000 barrels of road oil
Gases equivalent to 62,000,000 barrels of oil

This covers the principal products but does not include a wide range of specialties rapidly increasing in number and quantity. Many of these products are obtained from cracked gases as a result of polymerization, hydrogenation, and chemical compounding.

One needs only to review the technological progress made within the past year to understand the basis for the prediction that crude oil shortly will supply a large portion of the raw material from which will be made ethyl alcohol, ethylene, acetylene, organic acids, and hundreds of less important base materials. From these it is possible to prepare on a commercial scale such items as rubber substitutes, plastics, explosives, antifreeze materials, solvents, disinfectants, perfumes, soaps, and medicines. These enter directly into the daily routine of every individual.

This is not the complete refinery picture. Outside the United States more than 100 refineries, including three of the largest in the entire industry, are carrying on operations similar to those in this country. Producing largely the same products through the general use of American processes and equipment, they will add approximately 50 per cent to the totals shown for the United States.

Thus again the manufacture of petroleum products will expand, taking a leading position among all manufacturing industries in 1938.

General view of Baton Rouge, La., hydrogenation plant. Hydrogen production furnaces at right end of plant, catalyst chambers within concrete stalls at left end of plant

Production of Aviation Fuel by High Pressure Hydrogenation

By C. L. BROWN and J. A. TILTON
Standard Oil Co. of Louisiana

Aviation fuels of high antiknock values have, until the past few years, been limited with respect to available quantities. The domestic market for aviation fuels favors naphthas possessing high natural stability and market response to additions of tetraethyl lead. Virgin naphthas from select grades of crude oils have until recently proved to be the only feasible source for the production of satisfactory aviation fuels in large quantities.

In most instances, aviation fuels from select natural sources range in octane ratings from 72-75 by the A.S.T.M.-C.F.R. test, respond well to additions of tetraethyl lead and show a high degree of chemical stability. Because of their inherent qualities, virgin fuels have had heretofore practically a complete monopoly in the field of aviation.

Through the development of new types of catalysts the hydrogenation process is able to produce high octane aviation fuels similar in properties to virgin fuels. The catalysts employed for manufacture of aviation fuels possess the high resistance to poisoning and the long life demonstrated by earlier high pressure hydrogenation catalysts. The new catalysts operate in a moderate temperature range, give high conversions per pass and high ultimate yields of aviation naphtha.

The aviation naphthas produced from the new type of hydrogenation catalyst possess high octane numbers, equal or superior to those of virgin naphthas, have excellent lead susceptibility and have the high stability commonly associated with natural naphthas. The production of these naphthas on a commercial scale has made possible a pronounced increase in the potential supplies of high grade aviation fuels. In addition to their qualifications for use as aviation fuels directly, the hydrogenated naphthas are desirable base stocks for the preparation of 100 octane number fuels that are made by the incorporation of commercial isooctane. The hydrogenated naphthas require less of the high antiknock blending agents for a given octane number than do the virgin naphthas. The hydrogenated naphthas therefore furnish the means of expanding the supply of such premium fuel grades as the 100 octane number type through extending the application of the limited supplies of hydrogenated polymers.

The present paper describes: (a) the general method of operation for production of the high quality hydrogenated aviation fuels; and (b) the properties of the hydrogenated naphthas and their blends with the high octane number blending agents.

Hydrogenated Aviation Naphtha Production

The plant and method of operation for aviation gasoline production by high pressure hydrogenation are basically the same as described in earlier articles describing hydrogenation for lubricating oil improvement, hydrofining kerosenes and production of motor gasoline (1, 2, 3). A flow diagram illustrating the features of the process is given in Figure 1.

In the hydrogenation process, oil feed and fresh hydrogen are separately compressed to 200 atmospheres, are then mixed and passed through a heat exchanger countercurrent to the products of hydrogenation. The oil-gas mixture is heated in a fired coil, thence passed to the catalyst chamber where conversion takes place to the desired products. The reaction products go through a heat exchanger and cooler, thence to a high pressure separator where unreacted hydrogen is disengaged and then recycled by booster compressors. The liquid hydrogenated product is released to lower pressure, stabilized by removing the gaseous fractions lighter than butane and by removing part of the butane. The stabilized product flows to intermediate storage tanks from which it is taken for distillation into aviation fuel distillate and cycle stock. The aviation fuel requires only caustic washing for complete finishing and final storage.

As may be observed on the process flow sheet, cooling of the reaction mixture, as it passes through the catalyst chamber, is accomplished by introduction of recycle hydrogen gas at various points in the chambers. The cycle stock is either returned to the process in order to obtain ultimate conversion into aviation naphtha or is disposed of as high grade heavy naphtha and heavier distillates.

Commercial production of aviation fuels by high pressure hydrogenation is currently being carried out in the plant of the Baton Rouge refinery of the Standard Oil Co. of Louisiana. Ultimate conversion of feed stock to aviation gasoline is obtained by returning cycle stock with fresh feed. A summary of the feed stock and product inspections for large scale production is given in Table I.

It is to be observed that the naphtha of Table 1 has the volatility characteristics suitable for meeting all commercial and government distillation specifications; in addition it has sufficient volatility to serve as a blending base for high octane number blending agents. The commercial plant has also been operated to give an aviation gasoline of lower volatility than that of the naphtha in Table 1. Typical inspections of such a naphtha are given below:

HYDROGENATED AVIATION NAPHTHA OF LOWER VOLATILITY

A.P.I. Gravity	65 3
Reid Vapor Pressure, lb./sq. in.	6 7
Initial B.P., degrees Fahrenheit	109
Percentage at 167° F.	28
Percentage at 212° F.	63
Percentage at 275° F.	95
Final B.P., degrees Fahrenheit	290
Octane No., A.S.T.M.-C.F.R.	75 8

As may be noted, the less volatile naphtha also possesses an excellent octane number. It resembles in stability the lighter naphtha of Table 1, and in addition can be produced in somewhat higher ultimate yield than the more volatile product.

Experimental hydrogenation runs for production of aviation fuels have been made on a number

of charging stocks in order to determine the processing conditions required and the quality of the naphthas produced. Representative inspections of some typical feed stocks and the resulting aviation naphthas are given in Table 2.

From the data in Table 2 it will be observed that the new type of hydrogenation catalyst produces suitable aviation fuels from a variety of feed stocks. The aviation naphthas are of uniformly high octane number (75-78) and have marked lead susceptibility. They are also characterized by extremely low sulfur content and by high stability toward storage and oxidation as manifested by low acid heat values. It is to be noted that the low sulfur content and low acid heats are obtained independently of whether the feed has high or low sulfur percentage or is of virgin or cracked origin. From the general standpoint of octane number and plant capacity, heavy naphthas or light kerosenes of naphthenic or aromatic source have been found to form preferable feed stocks.

The results of commercial operation on aviation naphtha production taken together with experimental runs on a variety of charging stocks indicate that high pressure hydrogenation has opened the way for a marked increase in available quantities of high antiknock value aviation distillates. These naphthas not only are of value for use as fuel directly because of their high stability, high octane number and excellent lead susceptibility, but in addition, are of importance because of their suitability as base stocks to be used with commercial isooctane in the preparation of 100 octane number fuels.

The aviation naphthas produced by high pressure hydrogenation over the new types of catalyst resemble in stability and quality respects the light virgin naphthas obtained by distillation of high grade crudes. The hydrogenated fuels are saturated in character, having low acid heats and negligible gum content. In addition to showing the stability properties associated with virgin distillates, the hydrogenated naphthas possess higher octane numbers both in unleaded and leaded form than are commonly obtainable with the virgin fuels. The hydrogenated products also have markedly lower sulfur content than is to be found in the natural naphthas usually employed for aviation fuels. An inspection typical of hydrogenated aviation fuel which has been produced on a large scale is given in Table 3 in comparison with a representative virgin naphtha employed for aviation fuel.

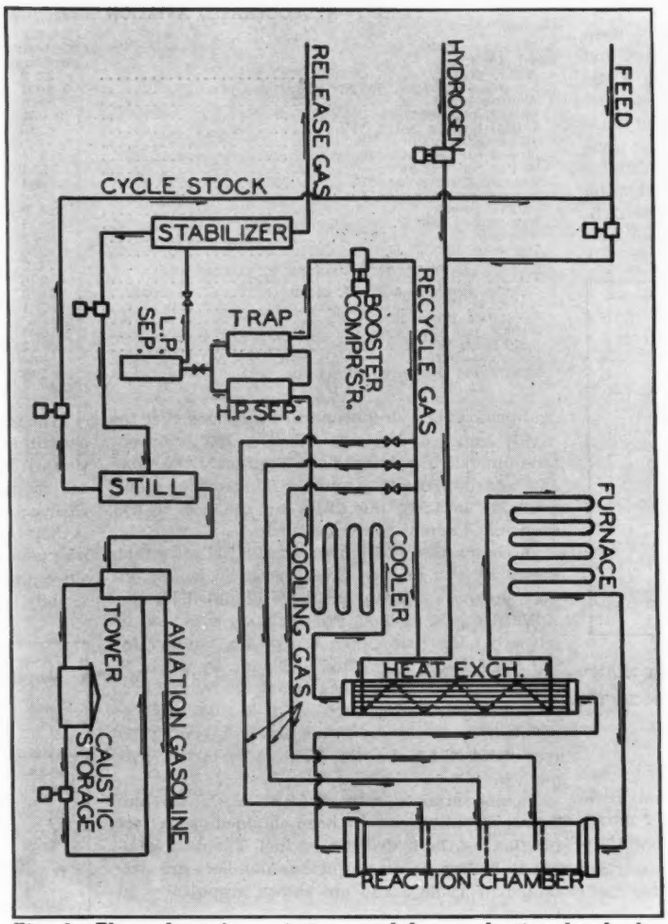


Fig. 1—Flow sheet for aviation naphtha production by hydrogenation

TABLE 1—TYPICAL FEED STOCK AND PRODUCT INSPECTIONS FOR COMMERCIAL SCALE AVIATION NAPHTHA PRODUCTION

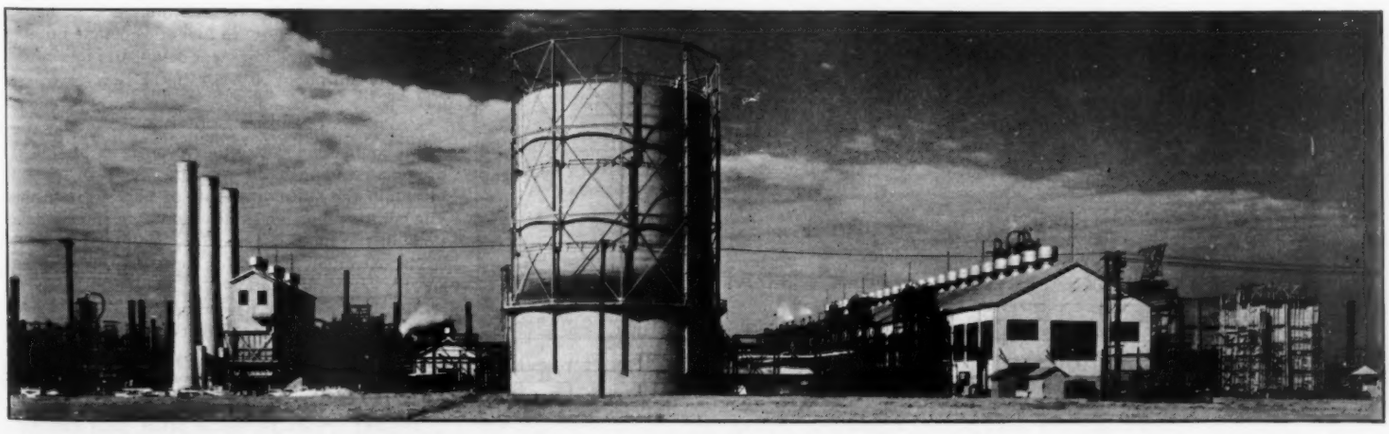
	Feed stock
Inspections of feed stock:	
Gravity, °A.P.I.	34 6
Initial B.P., °F.	327
Per cent at 302° F.	...
Per cent at 356° F.	...
Per cent at 392° F.	15 0
Per cent at 464° F.	66 0
Final B.P., °F.	550
Inspections of aviation naphtha:	
Gravity, A.P.I.	66 0
Initial B.P., °F.	115
Per cent at 149° F.	15 0
Per cent at 167° F.	30 5
Per cent at 212° F.	68 0
Per cent at 275° F.	97 0
Final B.P., °F.	295
Reid vapor pressure, lbs./sq. in.	6 7
Color, Saybolt	55+
Octane number, A.S.T.M.-C.F.R.	76 0

It will be noted in the comparison of Table 3 that the hydrogenated and virgin naphthas of approximately the same volatility show very similar stability characteristics as indicated by break-down time and copper dish gum values. Both are practically void of olefins as indicated by low bromine numbers and low acid heat values. In respect to stability, as measured by accepted tests, the two gasolines are essentially alike. Whereas both gasolines show sulfur contents well below the 0.1 per cent maximum usually included in most aviation fuel specifications, it is noteworthy that the hydrogenated naphtha shows the extremely low sulfur content of 0.005 per cent. The general inspections with respect to chemical nature and sulfur content indicate the hydrogenated fuel to be a well refined, highly stable product.

The antiknock value of naphthas proposed for aviation use is next in importance to the requirements of high stability. The base octane number (A.S.T.M.-C.F.R.) of the hydrogenated naphtha of Table 3 is about two points higher than that of the virgin naphtha (76.5 versus 74.2). As may be seen by the inspections of Table 2 on some experimental naphthas, it is feasible to increase this differential by producing hydrogenated naphthas of 78 octane number. The octane number advantage of the hydrogenated naphtha is of importance because of the current trend toward higher antiknock values in aviation fuels, both in base fuels and in leaded blends.

The response of potential aviation fuels to additions of tetraethyl lead is of importance comparable to that of the magnitude of the base octane numbers. The susceptibility of hydrogenated aviation fuel to additions of tetraethyl lead has been found to be high according to tests made by the A.S.T.M.-C.F.R. method, the U. S. Army Air Corps method, and the British Air Ministry method. The results of octane number tests by these methods, on natural and hydrogenated naphthas containing various concentrations of lead are given in Table 4.

It will be observed that the hydrogenated fuel is superior to the virgin fuel by each of the different test methods and at the different concentra-



Side view of Baton Rouge, La., hydrogenation plant. Hydrogen furnaces at left, hydrogen gas holder in center, compressor house in middle right and converter stalls at right

tions of tetraethyl lead.

The lead response data of Table 4 have been portrayed graphically for the A.S.T.M., Army and British Air Ministry methods. In Figure 2 the lead susceptibility curve of the hydrogenated fuel by the A.S.T.M.-C.F.R. method is shown, with tetraethyl lead additions as high as 10 cc. Further illustrations of the superior lead susceptibility characteristics of hydrogenated aviation naphtha are given in Figures 3 and 4, for tests by the U. S. Army Air Corps and British Air Ministry methods,

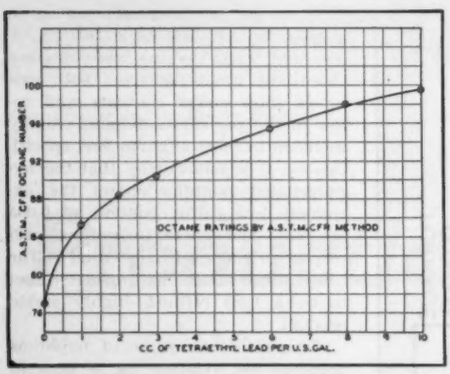


Fig. 2—Increase in A.S.T.M.-C.F.R. octane numbers on additions of tetraethyl lead to hydrogenated aviation gasoline

respectively. A particularly striking point is the fact that a 100 octane number (Army method) fuel can be obtained by the addition of 8 cc. of tetraethyl lead per gallon to the hydrogenated naphtha.

The importance now attached to the superior characteristics of the usual 100 octane number fuel (containing 3 cc. of lead) with respect to power and payload-carrying properties indicates that the highly leaded hydrogenated fuel of 100 Army octane number may also have a significant position. Fuels of the 100 octane number range can be made available in large quantities by the use of hydrogenated naphthas as base stocks.

A comparison of Figures 2 and 3 indicates that the Army test method gives increased leaded octane number values over those obtained by the A.S.T.M.-C.F.R. method. For example, with 8 cc. of tetraethyl lead per gallon the octane number by the A.S.T.M.-C.F.R. method is 98, and by the U. S. Army Air Corps method it reaches 100. With 10 cc. of tetraethyl lead per gallon added the hydrogenated fuel attains an octane rating exceeding 100 (estimated 101.5) by the U. S. Army Air Corps method.

Octane number ratings (A.S.T.M.-C.F.R.) and lead susceptibilities have been obtained on narrow fractions of the hydrogenated fuel. The data relating to boiling point and octane numbers are presented in Table 5 and are shown graphically on Figure 5.

TABLE 2—HYDROGENATED AVIATION NAPHTHAS FROM FOUR FEED STOCKS

	Coastal crude heavy naphtha	East Venezuelan cycle stock	Mirando cracked cycle stock	West Texas cracked cycle stock
Feed stock:				
A.P.I. gravity	32.9	31 0	26 1	31 8
Sp. gravity, 60° F./60° F.	0 8607	0 8708	0 8978	0 8665
Aniline point, °F.	115	102	81	100
Sulfur, per cent	0.051	0 39	0 06	0 68
Initial boiling point, °F.	280	316	211	238
10 per cent off at	360	412	416	376
50 per cent off at	424	450	465	451
90 per cent off at	503	513	520	538
Final boiling point, °F.	564	544	572	601
Hydrogenated aviation fuel:				
°A.P.I. gravity	64 9	65 9	62 0	61 8
Per cent at 158° F.	28 5	23 5	13 5	10 5
Per cent D + L at 167° F.	35 2	33 0	21 5	17.0
Per cent at 203° F.	62 0	70 0	54 0	57 0
Per cent D + L at 212° F.	71 7	76 0	66 0	68 0
F.B.P., °F.	278	290	268	278
Octane number, A.S.T.M. clear	78 3	76 0	76 8	75 3
+2.5 cc. Pb/gal.	92 1	88 4	...	...
+3.0 cc. Pb/gal.	...	...	90 8	90 4
Sulfur, per cent	0 007	0 003	0 001	0 006
Acid heat, °F.	2	3	2	2
Color, Saybolt	+30	+30	+30	+30
Reid vapor pressure, lbs./sq. in.	7.0	7 0	7 0	6 1

The results indicate that the highest anti-knock constituents are contained in the low boiling fractions. It will be noted that fractions boiling within the range of n-hexane (fractions 4 and 5) show clear octane numbers of about 77 A.S.T.M.-C.F.R. It is therefore unlikely that appreciable quantities of n-hexane exist in the gasoline fractions as such, since the octane rating of this hydrocarbon is usually reported to be 35 A.S.T.M.-C.F.R. The high

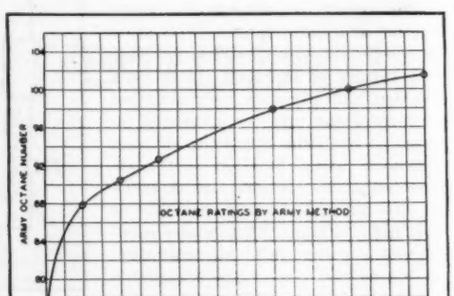


Fig. 3—Increase in Army octane numbers on additions of tetraethyl lead to hydrogenated aviation gasoline

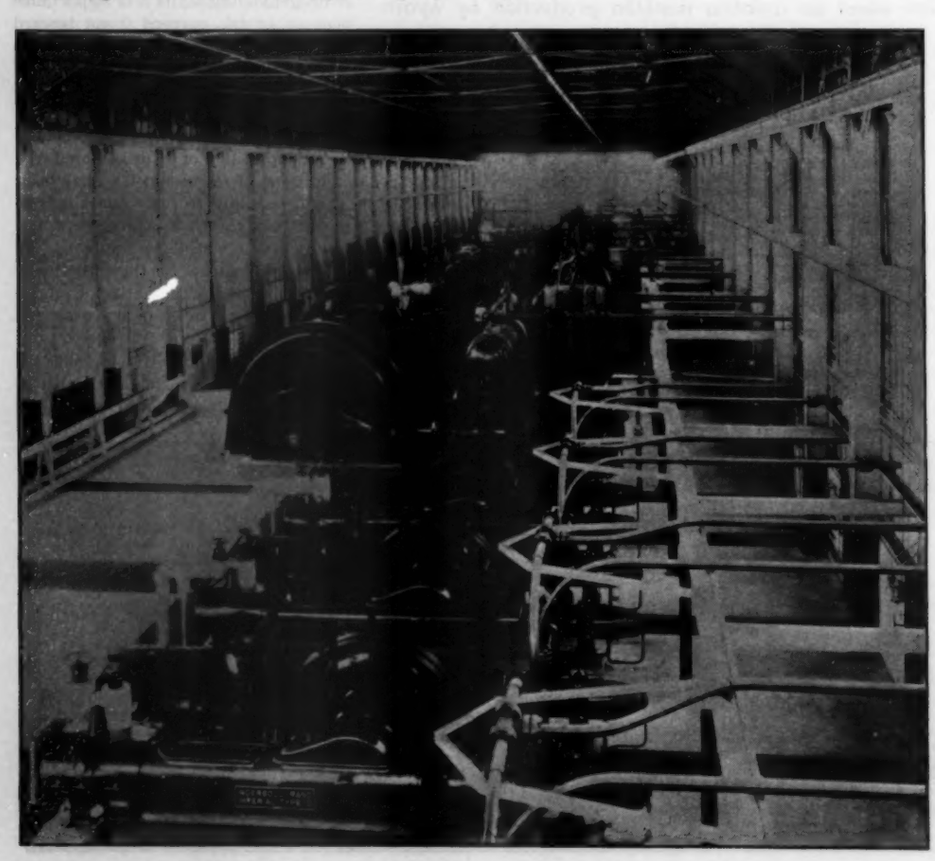
octane ratings of fractions in this boiling range suggest, instead, the possible presence of naphthenes and branched-chain paraffins, which hydrocarbons are known to have octane numbers considerably above that of n-hexane.

Octane number data for the first fraction of hydrogenated aviation gasoline (fraction numbers 1 and 2) are intentionally omitted on Table 5 in as much as these fractions boil mostly in the range of isopentane (83° F.) and present difficulty in the determination of their octane numbers. In blends with a standard reference fuel of 65 octane number the light fractions show clear octane number blending values of about 90 A.S.T.M.-C.F.R.

Sulfur Contents

In connection with other properties of the hydrogenated naphtha, it was considered of interest to obtain the sulfur contents of narrow fractions. The boiling points and sulfur contents of some fractions of the hydrogenated fuel are given in Table 6. The extremely low sulfur content (0.008 per cent and lower) of all fractions can be readily observed. Evidently the sulfur percentage varies little with the boiling point over the distillation range of the naphtha. The percentage of sulfur in the various cuts differs little from that of the total naphtha (0.005 per cent).

Present trends in the aviation field are definitely toward utilization of fuels with octane ratings of 100 by the U. S. Army Air Corps' method of



Compressor building of large-scale hydrogenation plant. Compressors for compressing and recycling hydrogen

test, the 100 octane number to be attained by the addition of moderate amounts of tetraethyl lead (ca. 3 cc. per gallon). This high-grade fuel is made possible at a reasonable cost by combining commercial isooctane and a high-grade aviation gasoline, 3 cc. of tetraethyl lead per gallon being added to the blend.

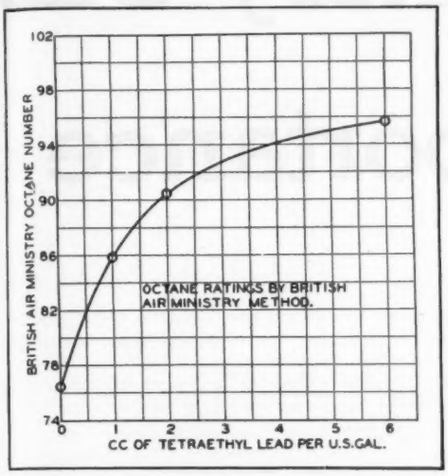


Fig. 4—Increase in British Air Ministry octane numbers on additions of tetraethyl lead to hydrogenated aviation gasoline

Hydrogenated naphthas serve as excellent base stocks in the preparation of 100 octane number fuel because of their high octane numbers, marked stability, and desirable volatility. Experimental data have therefore been obtained on the preparation of 100 O.N. blends employing a hydrogenated naphtha as base stock and hydrogenated dimer and hydrogenated co-dimer as high octane number blending materials. Commercial isooctane normally consists of a blend of either hydrogenated dimer or hydrogenated co-dimer with sufficient isopentane to bring the vapor pressure of the blend up to approximately 7 pounds Reid vapor pressure.

The hydrogenated dimer employed in the blends was obtained by high-pressure hydrogenation of a mixture of octenes consisting chiefly of diisobutylene. The octenes are obtained by polymerization of a refinery butene fraction to give a product consisting principally of polymerized isobutylene. The hydrogenated co-dimer was obtained by high-pressure hydrogenation of a mixture of octenes obtained by the inter-reaction of isobutylene and normal butylenes of a refinery butene. The properties of the hydrogenated dimer and hydrogenated co-dimer used in the preparation of the high octane number fuels are given in Table 7.

As may be observed in Table 7, the two high octane blending agents differ somewhat in boiling point and in octane numbers. Hydrogenated dimer has a lower mid-boiling point (212° F. versus 224° F.) and somewhat higher A.S.T.M.-C.F.R. octane number (99 versus 96.5) than hydrogenated co-dimer. As a result, somewhat less hydrogenated dimer is required in a blend to produce "100 Army" octane number fuel, and the volatility of the blend is higher than if hydrogenated co-dimer is employed.

The increase in supply of 100 octane number fuel by employment of a hydrogenated fuel can be realized without sacrifice in fuel quality as exemplified in the properties bearing on stability, sulfur or gum. Inspections of representative "100 Army" octane number blends employing hydrogenated aviation fuel and isopentane with (a) hydrogenated dimer and (b) hydrogenated co-dimer, with 3 cc. of tetraethyl lead per gallon used in each case, are presented in Table 8. These fuels comply with the specifications of the U. S. Army, the British Air Ministry and the French Air Ministry in every respect. The octane numbers are around 98 by the A.S.T.M.-C.F.R. method, and somewhat above 100 by the U. S. Army Air Corps method.

It will be observed from Table 8 that 100 octane number fuel can be prepared with a hydrogenated aviation naphtha and suitable blending agents. The low copper dish gum values, low acid heats and extremely low sulfur content are to be noted as marks of a high degree of refining and a high level of stability attached to these 100 octane number fuels.

The quantity of high octane blending agent required in the "100 Army" octane number can, of course, be reduced by adding lead beyond 3 cc. per gallon. Some blends have been prepared containing 6 cc. of tetraethyl lead per gallon and

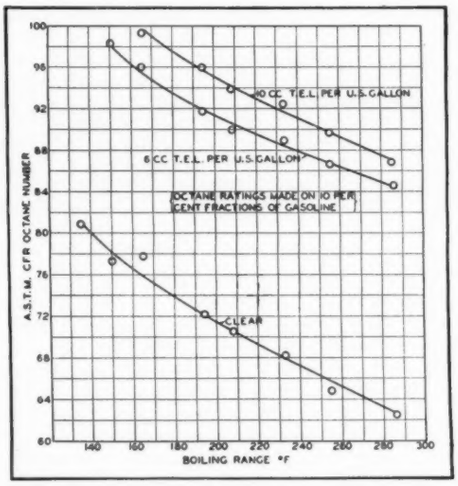

A.S.T.M. C.F.R. OCTANE NUMBER
BOILING RANGE °F
10 CC T.E.L. PER U.S. GALLON
6 CC T.E.L. PER U.S. GALLON
OCTANE RATINGS MADE ON 10 PER CENT FRACTIONS OF GASOLINE
CLEAR

Fig. 5—A.S.T.M.-C.F.R. octane number versus boiling range for hydrogenated aviation gasoline

are of somewhat higher volatility than the blend containing 3 cc.'s of tetraethyl lead and illustrated in Table 8.

While the use of hydrogenated aviation fuel in preparing blends of "100 Army" octane number is of importance, it can be used advantageously with hydrogenated dimer or hydrogenated co-dimer together with isopentane to produce fuels of lower octane number meeting certain other requirements. Such blends also possess a high stability, characteristics common to mixtures of the hydrogenated aviation naphtha and commercial isooctane or hydro co-dimer.

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TABLE 3—COMPARATIVE INSPECTIONS OF VIRGIN AND HYDROGENATED AVIATION NAPHTHAS

	Virgin aviation naphtha	Hydrogenated aviation naphtha from large-scale operation
Gravity, °A.P.I.	68 8	66 3
Color, Saybolt	+30	+30
Doctor	Pass	Pass
Copper dish corrosion	Pass	Pass
Copper dish gum, mgs./100 cc.	1.5	0 1
Sulfur, per cent	0 026	0 005
Breakdown time, hours	24+	24+
Acid heat, °F.	2	2
Bromine No.	2	2
Reid V.P. at 100° F., lbs./sq. in.	7.0	6 9
A.S.T.M. distillation:		
Initial, °F.	108	109
Per cent at 167° F.	31.0	32 0
Per cent at 212° F.	71.0	68 5
Final, °F.	276	272
Recovery, per cent	98.0	99 0
Sum of 10 + 50 per cent dist. temp., °F.	330	329
A.S.T.M.-C.F.R. Octane No.:		
Clear	74 2	76.5
1 cc. Pb/gallon	83 0	85 3
2 cc. Pb/gallon	86 5	88 5
3 cc. Pb/gallon	88 8	90 4
6 cc. Pb/gallon	93.5	95.5

TABLE 4—OCTANE NUMBERS BY A.S.T.M.-C.F.R., U. S. ARMY AIR CORPS AND BRITISH AIR MINISTRY METHODS ON CLEAR AND LEADED HYDROGENATED AND VIRGIN AVIATION FUELS

	Virgin aviation naphtha	Commercial (large scale) hydrogenated aviation naphtha
A.S.T.M.-C.F.R. Oct. Nos.:		
Clear	74 1	76 5
Plus 1 cc. Pb/gallon	82 9	85 3
Plus 3 cc. Pb/gallon	88 6	90 4
Plus 6 cc. Pb/gallon	93 2	95.5
Plus 8 cc. Pb/gallon	94 9	98.0
Plus 10 cc. Pb/gallon	97.0	99.4
U. S. Army Air Corps Oct. Nos.:		
Clear	72 8	76.0
Plus 1 cc. Pb/gallon	83 8	87 9
Plus 3 cc. Pb/gallon	90.2	92.7
Plus 6 cc. Pb/gallon	95 5	98 0
Plus 8 cc. Pb/gallon	98.6	100 0
Plus 10 cc. Pb/gallon	99.5	(*)
British Air Ministry Oct. Nos.:		
Clear	74 7	76 5
Plus 1 cc. Pb/gallon	82.6	85.9
Plus 3 cc. Pb/gallon	88.7	†90.5
Plus 6 cc. Pb/gallon	93.7	95.7

*Equal to pure isooctane plus 0.07 cc. Pb/gallon. †2 cc. Pb/gallon.

TABLE 5—OCTANE NUMBER-BOILING POINT RELATIONSHIPS OF HYDROGENATED AVIATION FUEL

(No lead, 6 cc. and 10 cc. of lead)

Fraction No.	Per cent of total naphtha	Average boiling point, °F.	A.S.T.M.-C.F.R. Oct. Nos. Clear	6 cc. Pb.	10 cc. Pb.
3	10	135	80 9	(*)	(*)
4	10	150	77.3	98 3	(*)
5	10	165	77.8	96.0	99.4
6	10	194	72.2	91.8	96.0
7	10	208	70.6	90.0	93.9
8	10	233	68.3	89.0	92.5
9	10	255	64 9	86 7	89 8
10	10	286	62 6	84.6	86 9

*Too high for test.

TABLE 6—SULFUR CONTENTS ON NARROW FRACTIONS OF HYDROGENATED FUEL

No.	Hydro aviation gasoline (per cent)	Mid-boiling point, °F.	Sulfur (per cent)
4	10	172	0 007
5	10	180	0 008
6	10	190	0 006
7	10	205	0 007
8	10	217	0 004
9	10	230	0 006
10	5	250	0 005
11 (bottoms)	5	282	0 007

TABLE 7—INSPECTIONS OF HYDROGENATED DIMER AND HYDROGENATED CO-DIMER

	Hydrogenated dimer	Hydrogenated co-dimer
Gravity, °A.P.I.	70 9	67 6
Color, Saybolt	+30	+30
Copper dish gum, mgs./100 cc.	0 9	0 5
Copper dish corrosion	Pass	Pass
Doctor	Pass	Pass
Per cent sulfur	0 004	0 006
Acid heat, °F.	2	1
Bromine No., g./100 g.	3	1
Breakdown time, hours	+24	+24
A.S.T.M.-C.F.R. oct. No.	99	96 5
Reid vapor pressure at 100° F., lbs.	2 8	2 8
A.S.T.M. distillation:		
Initial, °F.	178	161
10 per cent	207	213
30 per cent	211	222
50 per cent	212	224
70 per cent	213	227
90 per cent	216	231
95 per cent	223	234
Final, °F.	249	243
Recovery, per cent	98 0	98 0

TABLE 8—100 ARMY OCTANE NUMBER FUELS FROM HYDROGENATED AVIATION NAPHTHA AND HIGH OCTANE NUMBER BLENDING AGENTS

(Blends containing 3 cc. of tetraethyl lead per gallon)

	Hydrogenated dimer blend	Hydrogenated co-dimer blend
Gravity, °A.P.I.	70 5	69 5
Color	Blue	Blue
Copper dish gum, mgs./100 cc.	0 8	0 7
Copper dish corrosion	Pass	Pass
Doctor	Pass	Pass
Acid heat, °F.	2	2
Sulfur, per cent	0 006	0 006
Reid vapor pressure at 100° F., lbs.	6.9	7 0
A.S.T.M. distillation:		
Initial, °F.	107	105
Per cent at 167° F.	26 5	25 0
Per cent at 212° F.	70 0	58 0
Final, °F.	263	256
Recovery, per cent	99 0	99 0
Residue, per cent	0.6	0.7
Sum of 10 + 50 per cent dist. temp.	343	347
A.S.T.M.-C.F.R. octane No.	97 6	98.3
U. S. Army Air Corps Oct. No.	(*)	(†)

*Equal to pure isooctane plus 0.05 cc. Pb/gallon. †Equal to pure isooctane plus 0.06 cc. Pb/gallon.

Utilization of Refinery Gas of Increasing Importance

By H. STANLEY NORMAN

Utilization of gas in its natural state and from refinery stills continued to expand last year and the early part of 1938. One new field was explored on a semicommercial basis, that of producing aromatics from petroleum gases. Importance of developing aromatics from petroleum gases cannot be overestimated when it is realized that many countries are without coking grades of coal and without gas-manufacturing plants, both of which have been the chief source of aromatics for about 75 years. With the great increase in the production of petroleum and natural gas there has come about a situation which merits exploitation by refiners and chemical concerns. The Pure Oil Co. and Alco Products Division, American Locomotive Co., have been engaged in the commercial development of aromatic production from petroleum and natural gas for several years.

Importance of the problem has been extended recently, necessitating the construction of a development plant for detailed, large-scale studies of the mechanism of the aromatic formation from petroleum gases. A plant for continuation of the study was built at Toledo, Ohio, and it has been running as a development unit for several months.

Previous Work

Previous papers by Cooke, Swanson, and Wagner (Polymerizing Olefin-Bearing Gases); by Ridgway, Wagner, and Swanson (Products of Polymerization), and by Cooke, Wagner and Swanson (Organic Chemicals from Petroleum Natural Gas), have outlined in general the thermal polymerization process as practiced by Pure Oil-Alco.

The thermal process for production of aromatics from petroleum gases operates at relatively high temperatures with low pressures since these conditions are conducive to the maximum yields of aromatic compounds. Temperatures in excess of 1,100° F. and pressures below 300 pounds per square inch are employed. The thermal polymerization of refinery gases for the production of sulfur-free aromatic motor fuel as well as the three main aromatics, benzol, toluol, and xylol, is carried out at Toledo in a plant which has a capacity to produce about 100 bbls. of aromatics per day.

Mixture of Gases

Gases charged to the unit consist of a mixture of saturates and unsaturates, and they are derived from both vapor-phase and liquid-phase cracking units. For economy's sake the liquefied charge is prepared from these gases so that excessive amounts of inert materials will not be circulated through the polymerization unit with the resultant loss of fuel and general efficiency. The composition of the feed stock can be varied over a rather wide range by changing the ratio of fractionator gas to absorber gas, the two main sources of the feed stock in this plant. Studies have been made of the polymerization of mixtures of these gases under pressures ranging between 60 pounds square inch gauge and 300 pounds square inch gauge with temperatures varying from 1,050° F. and 1,350° F. The lower pressure requires compression of the gases from the cracking units, whereas while operating under 300 pounds pressure no compression has been required between the reaction zone and the stabilizer. Studies have indicated that ethylene is not converted in high percentages to aromatics, but the propylene is the main constitutent undergoing transformation. Distillates are currently obtained which show about 20 per cent benzol, 13 per cent toluol and 7 per cent xylol, the remainder of the distillate consisting of olefines, saturates and other nonaromatics.

The data obtained from this plant indicate that changes in the composition of the feed stock within reasonable ranges are substantially without influence upon the proportions with which the individual aromatic hydrocarbons are formed. It has also been observed that the yield of aromatic, based upon the distillate formed, increases with increasing temperature while the yield of total liquid products increases with decreasing temperature. As the reaction temperature is increased the plateaus become more sharply defined and the purity of the aromatic cuts increases markedly. Results obtained from the operation of this development plant indicate that the thermal polymerization of petroleum gases will contribute greatly to the production of aromatic hydrocarbons during the next few years. Plant-scale operation has indicated that it is not logical to charge such materials as methane and ethane to the polymerization plant since practically none of these materials is converted to aromatics under the conditions of operation.

Cracking Methane

The highly refractory nature of methane has baffled scientists for a long period and it is now felt that the conversion to useful liquid products is not feasible by thermal means but will of necessity have to be carried out in the presence of active catalysts.

Still another source of aromatics from petroleum and natural gas has been found to be the by-product liquid produced when operating gas-cracking units. When cracking saturate gases such as propane and butane at high temperatures,

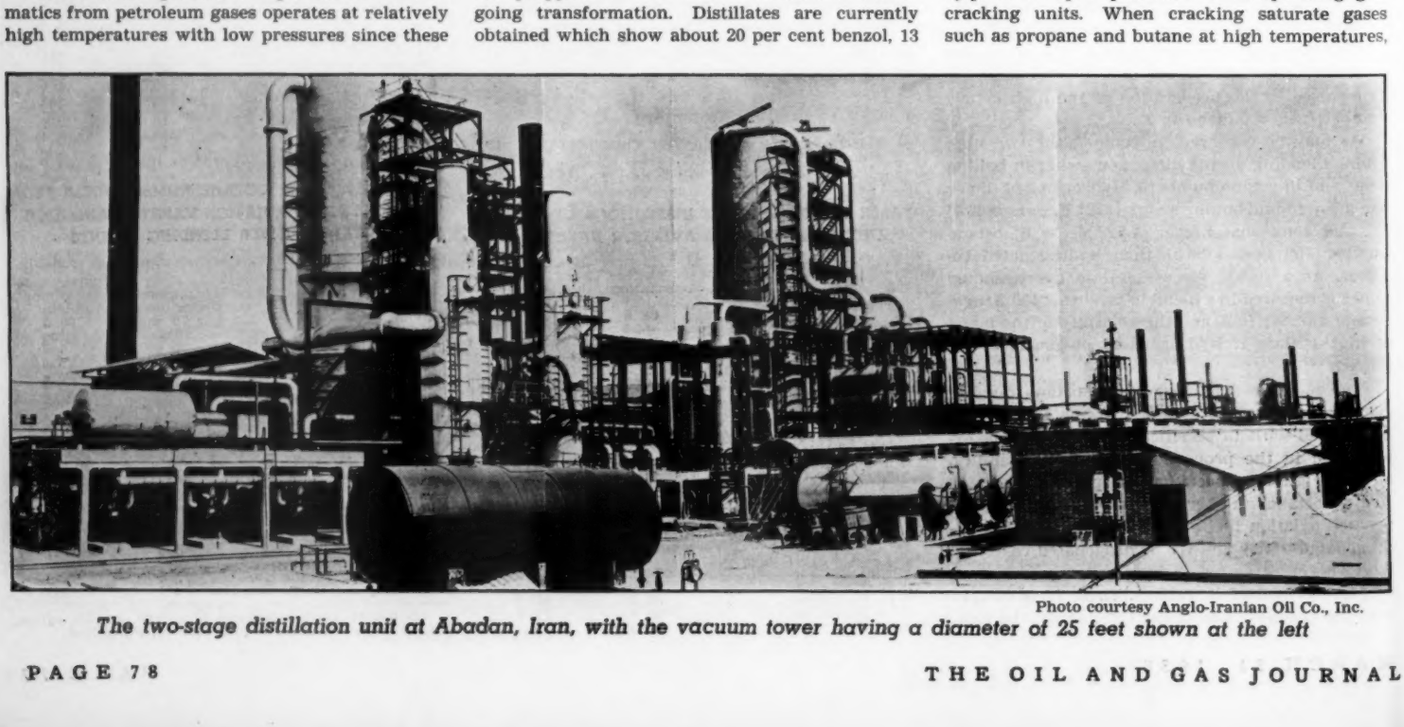
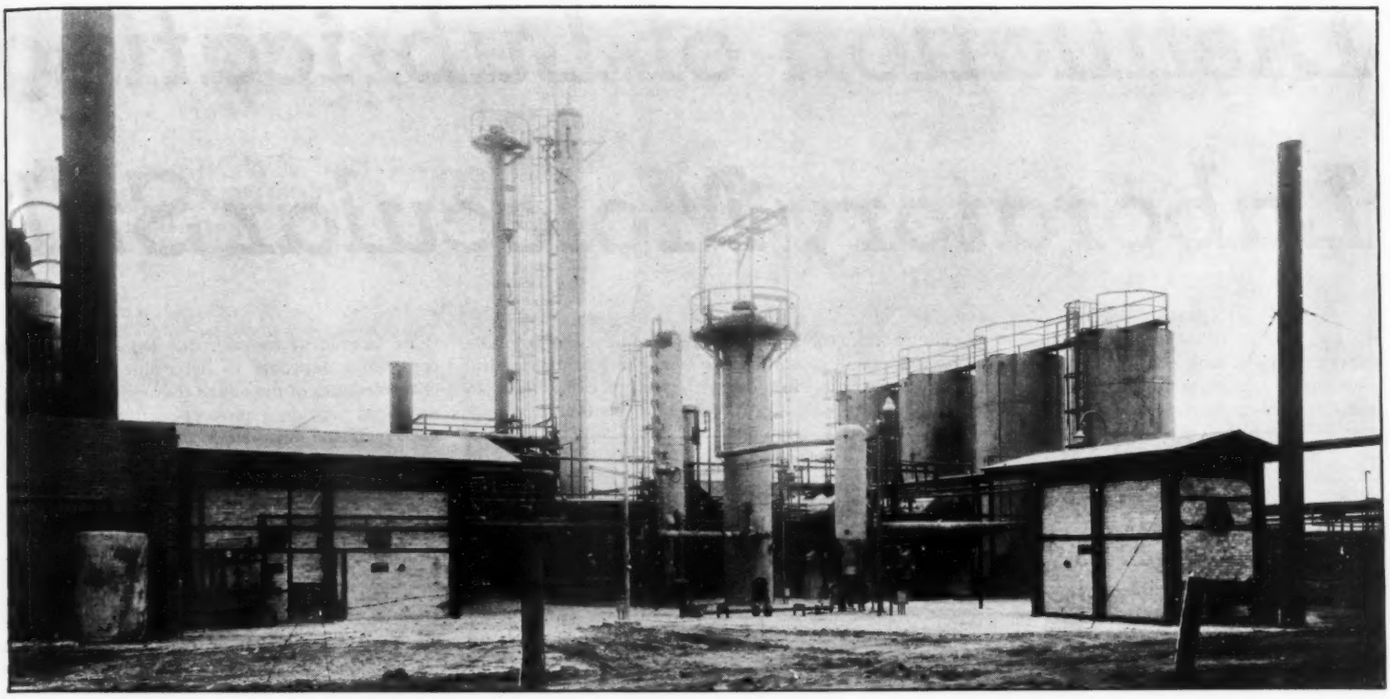


Photo courtesy Anglo-Iranian Oil Co., Inc.

The two-stage distillation unit at Abadan, Iran, with the vacuum tower having a diameter of 25 feet shown at the left



The development plant at Toledo where production of aromatics has been in progress for several months

there is obtained about 20 per cent of an aromatic distillate, which is similar in character to the aromatic distillate produced by thermal polymerization. After separation of the condensibles, including the aromatics, the gases are usually sent to a secondary polymerization unit, where additional aromatics are formed by polymerization.

The large variety of charging stocks which can be utilized and the degree to which operating conditions can be varied to produce either motor-fuel or coal-tar substitutes makes the plant highly flexible.

Commercial application of polymerization has not only contributed to production of aromatics or gasoline of high-octane blending qualities and reduced the waste of volatile gases, but has gone far toward removing natural limitations of charging stocks. Crude oils which may have limitations of quantity or quality of gasoline often can be converted into satisfactory charging stock by inclusion of selective cracking and polymerization units in the refinery equipment.

A case in point is the new combination refining unit constructed at La Plata, Argentina, for the Argentine Government Oilfields, or Yacimentos Petroliferos Fiscales. The distillation, cracking, polymerization, and treating phases function as a complete unit in a manner to overcome some of the inherent limitations of the crude available for processing.

In the La Plata refinery, which was built by Alco, the maximum yield of gasoline has been achieved by the use of successive cracking stages to yield carefully selected charging and recycle stocks having the most advantageous hydrogen-carbon ratio.

Comodoro Rivadavia crude oil on which the new Y.P.F. combination unit operates contains considerable quantities of emulsified salt water. In producing the maximum yield of gasoline from Comodoro Rivadavia crude, which contains a high percentage of asphalt, design engineers gave careful attention to the matter of selecting stocks for cracking.

The once-through viscosity-breaking operation practiced in the La Plata unit reduces the asphalt to low-viscosity fuel oil with the production of light and heavy gas oil and a minimum percentage of cracked gasoline. Each of these products is then thermally decomposed in a Gyro cracking unit under the optimum temperature and pressure conditions in the light and heavy gas-oil cracking coils respectively.

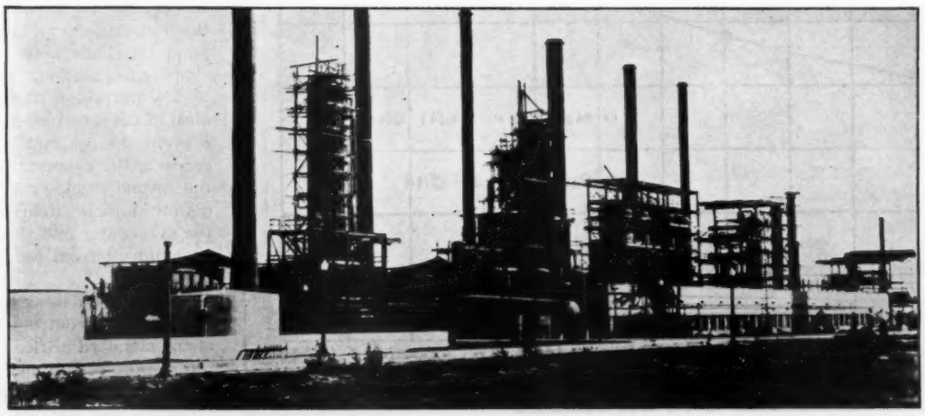
In order to obtain the maximum octane gasoline from such charging stock, it was necessary to produce a relatively high percentage of gas. The installation therefore included a polymerization plant of the Pure Oil-Alco thermal type so that the entire plant would not be at a disadvantage in respect to relatively high gas fractions consumed in the fuel system or discharged into atmosphere. By charging this gas to the polymerization unit, a blending stock high in octane blending quality is obtained which not only brings up the yield of cracked gasoline but also makes it possible to raise the overall octane value of the finished gasoline.

Fresh crude stock draws heat from reflux and gas-oil sidestream exchangers of both the topping and cracking stages. The preheated charge is then introduced into a settling-drum where salt water is withdrawn under pressure. The dehydrated crude is pumped through the crude furnace where it attains an outlet temperature sufficient to effect the desired degree of vaporization and is then introduced into the flash zone of the crude fractionating tower. Gasoline vapors taken overhead from the crude tower are condensed. A sidestream of kerosene is removed from a selected tray in the fractionating tower. A liquid sidestream of gas oil is removed directly from the fractionating tower. In order to give high flexibility, a sidestream of heavy gas oil is removed from the crude fractionating tower and can be introduced into the upper section of the heavy-oil fractionator or the cracking unit. The bottoms from the crude fractionating tower are charged to the viscosity-breaking furnace where the stock is subjected to set conditions.

Bottoms from the visbreaker evaporator are introduced into a vacuum flash tower where the heavy cracking stock is removed and the bottoms then flow through the fuel-oil cooler to storage.

A clean selected gas-oil stock is withdrawn from the reservoir section of the light-oil fractionating tower and pumped from the light-oil preheating coil and then introduced into an evaporator, where true

(Continued on Page 94)



The Argentine Government Oilfield (Y.P.F.) combination unit at La Plata, Argentina, showing, from left to right, the crude tower, cracking unit, polymerization plant and the treating installation

Distillation of Lubricating Laboratory Molecular Still

In the ordinary methods of manufacture of lubricating oils, it is frequently necessary to use acid or some other treatment on the distillates from the distillation plant in order to produce color stable products. It has been generally appreciated that at least a portion of this chemical treatment is required to correct degradation in quality resulting from plant distillation conditions. In order to measure this degradation, it was considered desirable to determine the inherent characteristics of the oils as they exist in the crude and thus provide a product-quality standard for measuring the degradation occurring during various plant distillation operations. To effect the necessary segregation of the lubricating fractions, recourse was had to distillation of the lube stocks from the crude under very nearly ideal conditions.

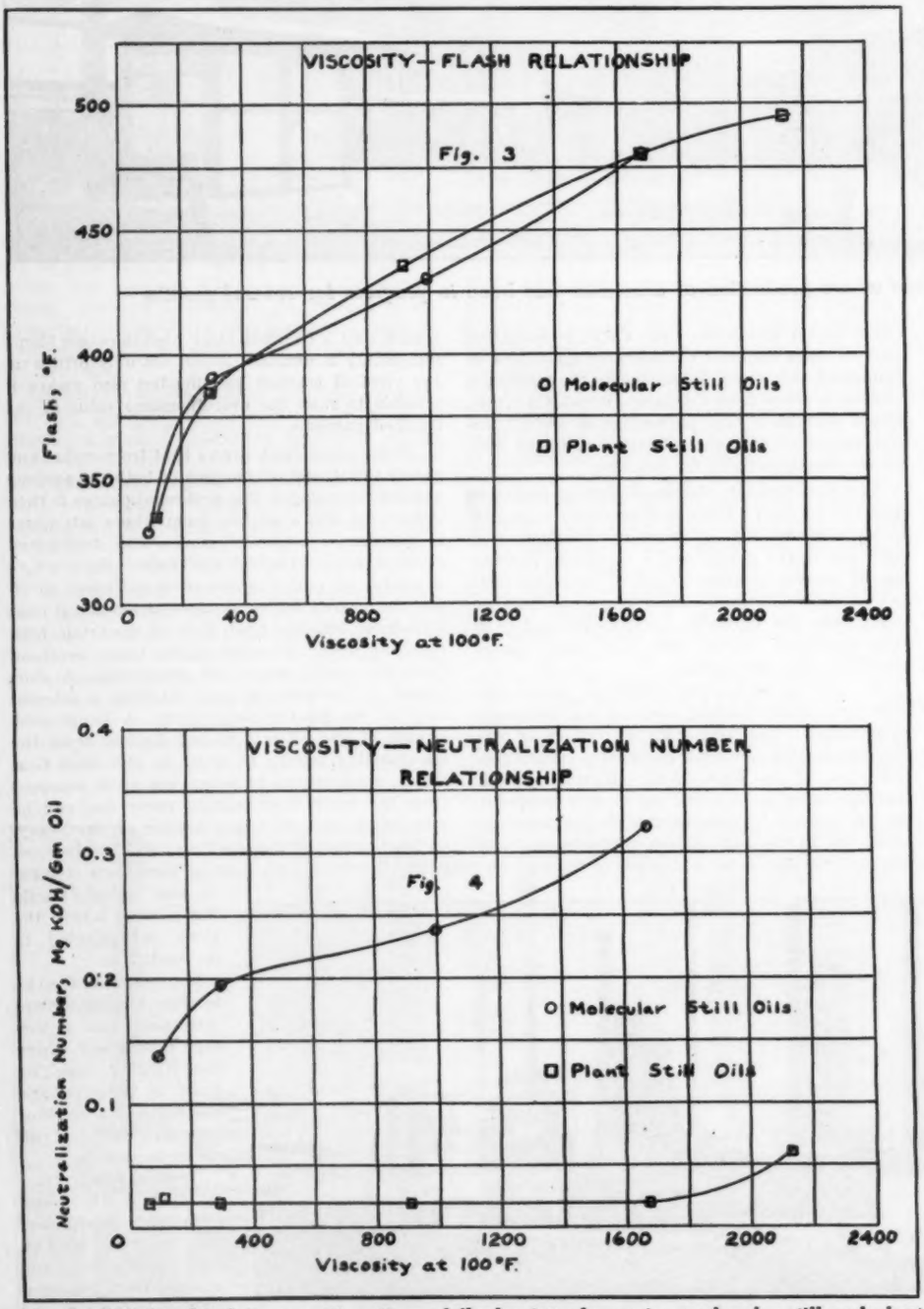


Fig. 3—Relationship between viscosity and flashpoint when using molecular still and plant still. Fig. 4—Relationship between viscosity and neutralization number when using molecular still and plant still

To realize the nearly ideal distillation conditions, there was designed and put into operation a continuous molecular distillation apparatus (Figure 1)—a modification of a design furnished by Dr. K. C. D. Hickman of the Eastman Kodak Co.—which employs indirect heating and effects distillation from a film of oil flowing over an evaporating surface held at a maximum temperature of 400° F. or lower, the retention time of the oil in the distilling section being only a few minutes. The still is operated under an absolute pressure varying between 10^{-5} and 10^{-3} millimeters of mercury. The term "molecular distillation" implies the transfer of a vapor from an evaporating surface to a nearby condensing surface under an absolute pressure that will make the free path of the majority of the molecules emerging from the evaporating surface greater than the distance to the condensing surface.

Apparatus

The molecular-film distillation apparatus (Figure 1) employed in this work consists of the following essential parts: A first stage degasser C; a combination second stage degasser and adjustable constant-feed-rate control D; an evaporator consisting of sections F and E, which have areas of 10.3 square inches and 35.3 square inches, respectively; a condensing surface A; a mercury boiler M; a closed system QFP for thermal circulation of liquid mercury; a mercury diffusion pump T; a charge vessel G; two graduated distillate receivers K and L; two graduated residue receivers I and J; a McLeod gauge (not shown); three electric heaters H, R, and O; two traps X and S; a relatively high absolute pressure vacuum pump (not shown) for the first degasser; a low absolute pressure vacuum pump (not shown) for the second degasser and the evaporating section.

The purpose of the first degasser is to remove most of the dissolved gases which would otherwise prevent the realization of the low absolute pressures in the evaporating section. The purpose of the second degasser is to remove the remaining dissolved gases from the charge before it reaches the evaporator and thereby prevent frothing and entrainment from occurring in the distilling section.

The second degasser D is also an adjustable constant-feed-rate control and is based on the principle of the standard orifice equation; any desired feed rate can be set up and maintained by holding an almost constant level of liquid in the reservoir (accomplished by intermittently establishing a relatively high pressure in degasser C and thereby displacing oil from it into degasser D) and properly adjusting the size of the orifice which conducts

Oils in a

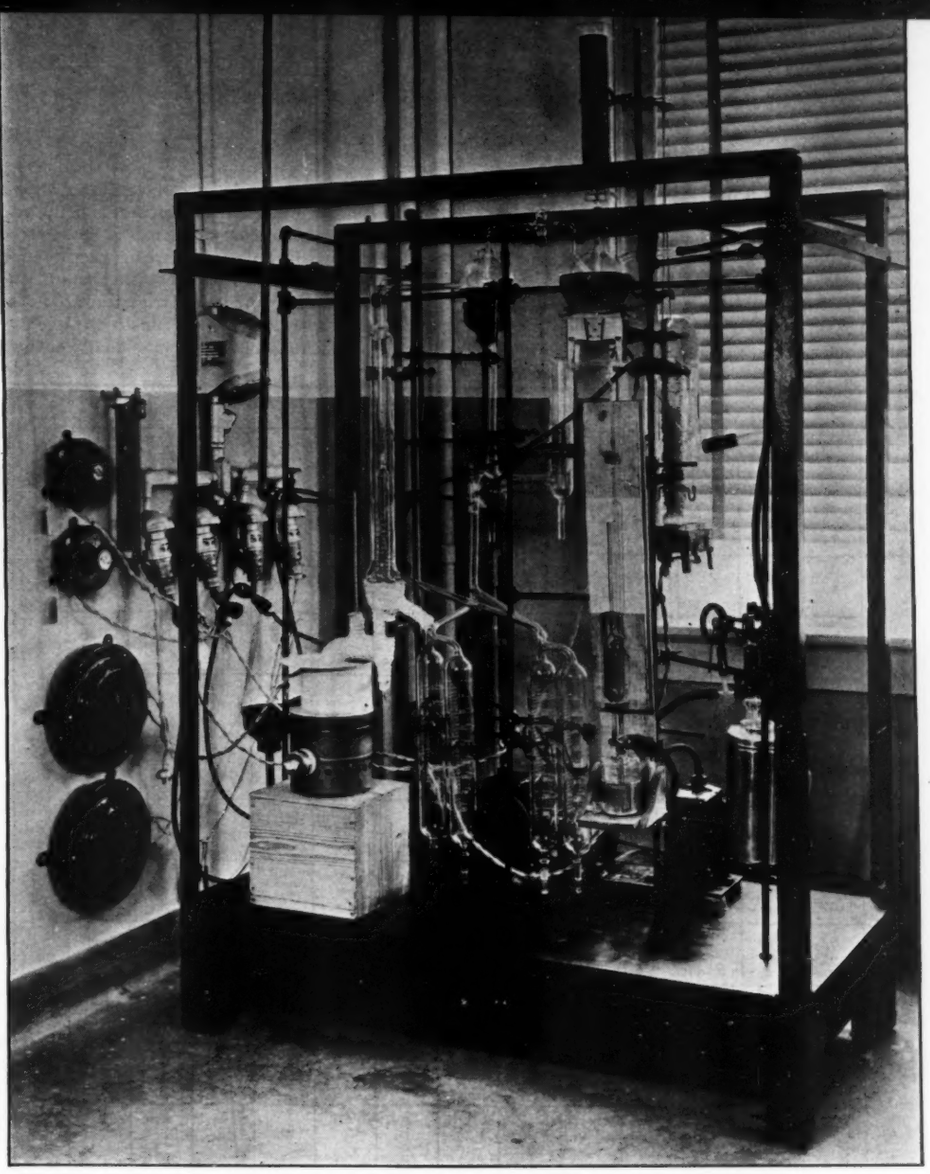
By O. A. BROWN and R. A. TANNICH
Technical and Research Department, Humble Oil & Refining Co.

the charge from this section into the distilling section. The orifice is conical in shape and is fitted with a ground glass plug on the end of a glass rod which in turn is attached to a brass screw threaded through a brass plate anchored to the walls of the dome-shaped extension of the degasser as shown in the diagram (Figure 1). By raising or lowering the ground glass plug in the orifice, which is accomplished by actuating the attached brass screw in the proper direction through the aid of an electromagnet's attraction for the horizontal iron bar brazed to the top of the screw, the flow of charge into the distilling section can be regulated to any quantity or shut off entirely as desired.

Section F, which acts as a preheater as well as an evaporator, is heated indirectly by the circulating liquid mercury in the closed system QFP. Section E, where the main portion of the evaporation occurs, and Section Q of the circulating mercury system are heated indirectly by the mercury vapors rising from the mercury boiler. The mercury diffusion pump serves to maintain a high vacuum on the system. An auxiliary vacuum pump, not included in the pumps listed above, is used in connection with the operation of the McLeod gauge.

The temperatures and feed rates employed in the operation of the molecular-film still depend on the properties of the charge stock, the distillate product desired, and, to a very limited extent, the absolute pressure in the system. The average charge rate is about 50 cc. per hour.

Since the molecular still as set up is not a satisfactory apparatus for removing gasoline, kerosene and light gas oil from crude, a crude of the Coastal type was topped in a laboratory atmospheric glass still heated with an oil bath at a maximum temperature of 400° F. for removal of these products as a preliminary step. The reduced crude was then changed to the molecular still and distilled at a maximum temperature of 400° F. into a broad-cut



Molecular still for processing lubricants

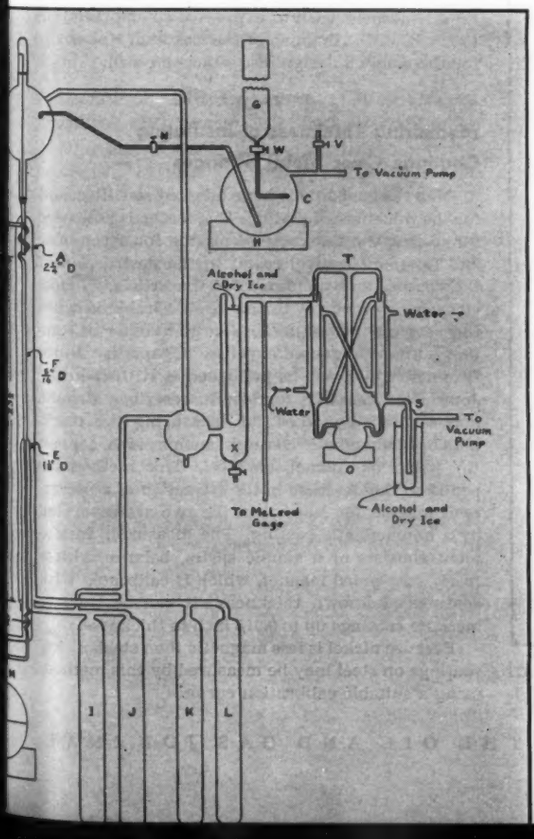


Fig. 1—Sketch of apparatus comprising molecular still

TABLE 1—OILS PRODUCED BY MOLECULAR DISTILLATION

Cut number	1	2	3	4
Gravity, °A.P.I.	23 5	22 1	20 6	21 3
Flash, °F.	330	390	430	480
Fire, °F.	380	440	500	545
Viscosity at 100° F.	98	301	994	1678
Viscosity at 210° F.	37 6	47 1	65 8	88 3
Original color:				
T.R.	17	12¾	9¾	6½
Absolute*	36	68	185	430
Three months' storage color:				
T.R.	16½	11½	9¼	4¼
Absolute*	38	93	260	660
Six months' storage color:				
T.R.	16¼	12	9¼	3¾
Absolute*	39	81	260	740
Neutralization number, mgs. KOH/Gm. oil	0 140	0 196	0 238	0 322
Conradson carbon residue, per cent	0 006	0 01	0 084	0 33
Maximum still temperature, °F.	292	304	330	400

by Carl Winning, Standard Oil Development Co. *From a correlation of Robinson and absolute colors

TABLE 2—OILS (STREAM SAMPLES) PRODUCED BY PLANT DISTILLATION

Product—	Charge	Stream number 5	6	7	8	9	10
Gravity, °A.P.I.	22 5	25 3	23 7	21 9	20 4	20 2	20 8
Flash, °F.	340	290	335	385	435	480	495
Fire, °F.	370	320	375	425	490	540	575
Viscosity at 100° F.	212	64	114	289	907	1674	2127
Viscosity at 210° F.	44 4	....	....	47 2	65 4	84 5	100 8
Original color:							
T.R.	1¼	17	14½	11¾	9¼	8	2¼
Absolute*	2250	36	50	86	260	350	1250
One week's storage color:							
T.R.	1⅛	14	12½	10¾	+9+	6¼	1½
Absolute*	2500	54	72	118	315	445	1880
2.4 months' storage color:							
T.R.	1	9¾	7	4½	2½	2¼	⅝
Absolute*	2800	185	400	620	1120	1250	4650
Cloud (A.S.T.M.), °F.	....	<—20	<—30	<—36	<—20	6	dark
Pour, °F.	0	<—50	<—50	—35	—10	0	30
Neutralization No., Mgs. KOH/Gm. oil	0 59	0 02	0 025	0 02	0 02	0 02	0 06
Conradson carbon residue, per cent	0 06	0 02	0.02	0.025	0.05	0 019	0 52

*From a correlation of Robinson and absolute colors by Carl Winning, Standard Oil Development Co.

lube distillate and a heavy bottoms, the latter being discarded in this study. The broad-cut lube distillate was subsequently batch caustic-extracted in a glass percolator at 180° F. for partial removal of naphthenic acids, and then redistilled in the molecular still into a heavy gas oil cut and four lube oil cuts of approximately equal yields at maximum temperatures ranging from 290° F. to 400° F. The cuts were taken off in successive flash distillations, one passage through the apparatus being required for the production of each cut. The above-mentioned procedure was adopted for the production of the molecularly distilled oils because (1) it would make them comparable with the products from a plant operation, which consisted of redistilling over caustic a broad-cut lube distillate that had previously been distilled from the crude, and (2) the redistillation of the broad-cut, as opposed to direct separation of the fractions from the topped crude, would provide better fractionated products.

The time and expense involved would not permit the production of molecularly distilled oils duplicating in all cases the viscosities of plant distilled oils; therefore, in order to facilitate a better comparison of these two types of products, plots were made of (1) viscosity versus absolute color before and after being stored (Figure 2); (2) viscosity versus flash (Figure 3), and (3) viscosity versus neutralization number (Figure 4).

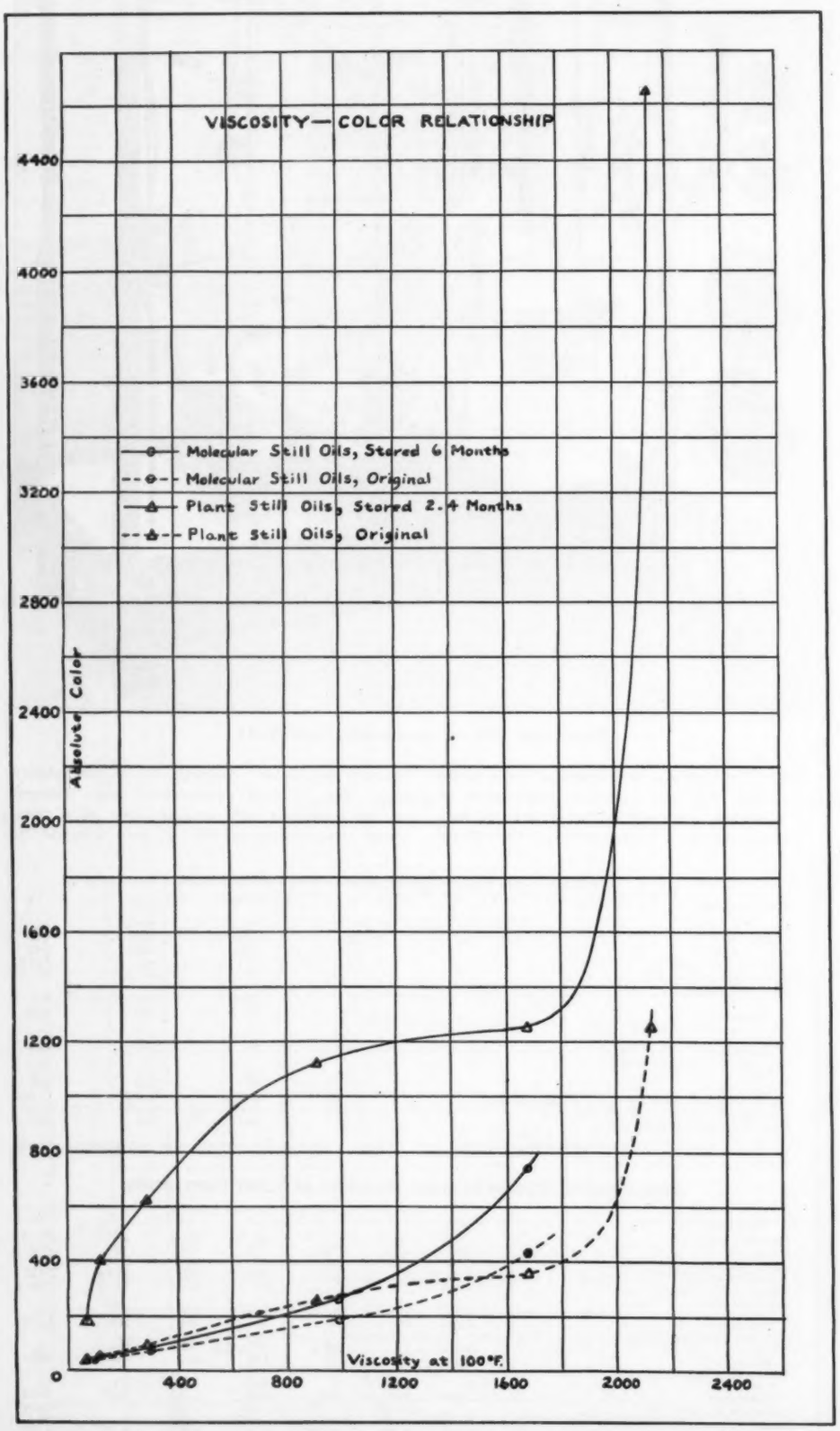


Fig. 2—Relationship between viscosity of oil and its color when processing the material through the plant and molecular stills

Discussion of Results

The lubricating oils produced by the molecular distillation of the lube stock were superior to the similar products of plant distillation, as indicated by the colors before and after 2.4 and 6 months of storage for plant and laboratory samples, respectively (Figure 2, Tables 1 and 2). The flash characteristics of molecularly and plant distilled oils were practically the same (Figure 3).

The oils produced by molecular distillation had good original colors, except for the heaviest cut which is definitely known to contain some entrainment—an inherent characteristic of the molecular distillation when running to a very low bottoms with a low charge rate—and therefore cannot be considered as representative. The most significant characteristic about these oils produced under almost ideal distillation conditions is that they suffered very little impairment of color while in storage for a period of six months.

The relative instability of the unfinished plant distilled oils is thus demonstrated to be due to the severe distillation conditions under which they are produced; namely, long retention times and relatively high oil temperatures.

Conclusions

It is concluded that the constituents of lubricating oils as they exist in coastal crudes are inherently color stable, and that the instability of untreated oils produced by the usual methods of distillation is due primarily to the presence of decomposition products resulting from the thermal treatment to which the oils are normally subjected.

Acknowledgement

The authors wish to express their appreciation to Dr. K. C. D. Hickman of the Eastman Kodak Co. for the original design of a molecular still.

Measuring Thickness of Insulating Coatings Over Metal Surfaces

Many organizations have adopted specifications for the thickness of plating. The methods now used for testing the thickness of plating for acceptance and for plant control result in the destruction of the coating and sometimes of the article. Nondestructive methods of testing are desirable because they permit the testing of a large number of samples without increased expense. A paper by Abner Brenner, which will be published as RP1081 in the Journal of Research for March, describes a rapid, nondestructive method for measuring the thickness of nonmagnetic coatings, such as zinc, copper, tin, paint, or enamel, on steel. This method depends on the decrease in the attraction of a permanent magnet for iron when the two are separated by a nonmagnetic coating. The measuring instrument consists of a simple spring balance with a freely suspended magnet, which is calibrated with coatings of known thickness. It can be used to measure coatings up to 0.015 inch in thickness.

Because nickel is less magnetic than steel, nickel coatings on steel may be measured by this method, using a suitable calibration curve.

Improving Gasoline by Caustic Washing

By C. M. RIDGWAY
Pure Oil Co.

In the course of an investigation of caustic washing gasoline, a very considerable amount of data was obtained and a survey was made of the existing literature. The increase in mercaptan sulfur content of the gasoline at a certain refinery, accompanied by an increase in the tetraethyl lead requirement to meet the desired octane number, motivated this investigation and emphasized the importance of sulfur content and

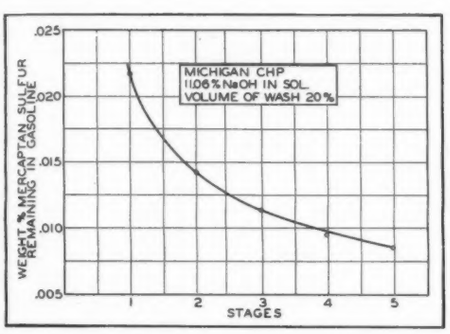


Fig. 1—Influence of caustic strength upon mercaptan removal

type of sulfur compounds. It is believed that a summary of the results and data obtained, typical calculations, and a survey of the pertinent literature, may be of interest.

Influence of Sulfur Compounds Upon Octane Number and Tetraethyl Lead Requirement

The data in Table 1, obtained from an article written by Birch and Stansfield,[5] indicates the influence of various sulfur compounds upon a Venezuelan straightrun gasoline.

The influence of changing the amount of Ethyl disulfide[6] upon the octane number of a 65-octane fuel to which 3 cc. of Ethyl fluid has been added is illustrated in Table 2.

It is to be observed that the first increment of .05 per cent sulfur is three times as detrimental as the second increment, and four times as detrimental as the third and fourth increments. If these data are plotted, certain approximations, the results of which are on the low side, may be made and expressed as in Table 3.

Since we consider the evidence that the first

TABLE 3—RESULTS FROM ADDING SULFUR COMPOUND

Influence of sulfur measured as decrease in octane

% sulfur as Ethyl disulfide	O.N. decrease realized	Per increment of 0.01% sulfur
.01	1.8	1.8
.02	3.36	1.668
.025	4	1.60
.05	6	1.2
.075		1.0
.10	8	.8
.20	11	.55

TABLE 1—EFFECT OF SULFUR ON TETRAETHYL LEAD REQUIREMENTS

Adding 1% sulfur as following compounds

Blend—	Final octane	Initial octane	Octane rise	Octane rise for first cc.	CC.'s Ethyl fluid to 70.5 octane	Increase in Ethyl fluid
Gasoline	70.5	64.4	6.1	11.4	.535	
Gasoline + EtSH	70.5	63.6	6.9	5.82	1.33	.795
Gasoline + Et_2S	70.5	64.6	5.9	12.2	.825	.290
Gasoline + Et_2S_2	70.5	64.0	6.5	..	1.4025	.8675
Gasoline + Et_2S_3	70.5	62.0	8.5	..	1.787	1.252

TABLE 2—EFFECT OF ADDING SULFUR COMPOUNDS

Concentration of disulfide (% sulfur)	Octane number	Increase in octane due to lead	Octane decrease due to sulfur	Change per increment of .05%
0.00	84	19	0	0
0.05	78	13	6	6
0.10	76	11	8	2
0.20	73	8	11	1.5

TABLE 4—EFFECT OF ADDING INCREMENTS OF SULFUR

Increase in Ethyl fluid, cc./gal.

Sulfur compound—	Per cent sulfur .01	.01	.005	.001
Mercaptan	.7950	.18	.093	.0186
Alkyl disulfide	.2900	.066	.034	.0068
Dialkyl disulfide	.8675	.197	.101	.0202
Dialkyl trisulfide	1.2520	.285	.147	.0294

Iranian Straightrun[5]

Blend—	Final octane	Initial octane	Octane rise	CC. Ethyl fluid to 70.5	Increase in Ethyl fluid
Gasoline	70.5	55.3	15.2	1.58	
Gasoline + EtSH	70.5	55.0	15.5	3.09	1.51
Gasoline + Et_2S	70.5	55.4	15.1	2.67	1.09
Gasoline + Et_2S_2	70.5	55.4	15.1	3.08	1.50
Gasoline + Et_2S_3	70.5	52.5	18.0	3.57	1.99

TABLE 5—EFFECT OF ADDING SULFUR TO VENEZUELAN GASOLINE

Increase in Ethyl fluid, cc./gal.

Sulfur compound—	Per cent sulfur 0.1	.01	.005	.001
Mercaptan	1.51	.343	.177	.0354
Alkyl disulfide	1.09	.248	.128	.0256
Dialkyl disulfide	1.50	.341	.17653	.0353
Dialkyl trisulfide	1.99	.452	.233	.0465

Cracked Gasoline[5]

Leading to 70.5 octane with 0.1% sulfur added

	Octane	Octane rise to 70.5	CC. Ethyl fluid to 70.5	Increase cc./gal.
Gasoline	65	5.5	.49	
Gasoline + EtSH	64.8	5.7	.77	.28
Gasoline + Et_2S_2	64.8	5.7	1.141	.65

Increase in Ethyl fluid, cc./gal.

	Per cent sulfur 0.1	.01	.005	.001
Mercaptan	0.28	.0636	.0326	.00652
Dialkyl disulfide	0.65	.1480	.0760	.0152

Heptane-Octane Blend[5]

Leading to 70.5 octane with 0.1% sulfur added

	Octane	Octane rise to 70.5	CC. Ethyl fluid to 70.5	Increase cc./gal.
Blend			.41	
Blend + EtSH	64	6.5	1.13	.72
Blend + Et_2S_2	65	5.5	1.13	.72
Blend + Et_2S_3	63.5	7.0	..	..
Blend + EtSH doctor-sweetened	60.4	10.1	1.71	1.30

TABLE 6—INFLUENCE OF MERCAPTAN SULFUR ON OCTANE NUMBER AND TETRAETHYL LEAD RESPONSE

Data from the Pure Oil Co. and Birch and Stansfield[5]

Stock—	Octane No.	Amount mercaptan sulfur	CC./gal. increase in Ethyl fluid to reach 70.5: Total TEL requirement	TEL requirement per .01% mercaptan sulfur
Michigan straightrun	47.0	.016	.17	.106
Mid-Continent straightrun	57.2	.011	.14	.127
Lima straightrun	52.1	.020	.35	.175
Venezuelan straightrun	64.4	.10	.795	.18
Iranian straightrun	55.3	.10	1.51	.343
Cracked Iranian gasoline	65.0	.10	.28	.0636
Blend cracked gasoline (mixed crudes)	61.5	.027	..	..
Michigan combination high-pressure gasoline	61.2	.017	.11	.0646

increments of sulfur are more effective than subsequent additions and use the previous approximations, the data may be expressed as in Table 4 for various gasolines.

Using the approximations for the Venezuelan

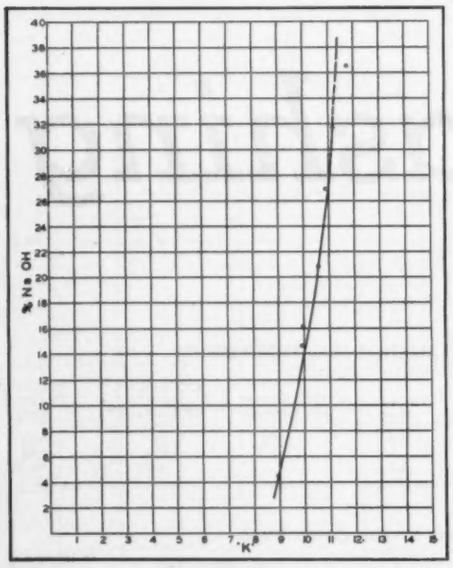


Fig. 2—Effect of caustic strength on "K"

gasoline, the influence of various increments is shown in Table 5 when leading to 70.5 octane.

The Birch-Stansfield data (Table 6) indicate that dialkyl sulfides are not as detrimental as are mercaptans, while dialkyl disulfides are approximately 10 per cent more detrimental than mercaptans, and dialkyl trisulfides are approximately 1.58 times as detrimental as the mercaptans in increasing the lead load. These data clearly indicate that an appreciable saving can be realized by the removal of sulfur compounds and that if the extracted gasoline is carefully doctor-sweetened, the saving in tetraethyl lead will probably be somewhat in excess of the amount which would be expected on the basis of mercaptan removal.

Factors Influencing the Extraction of Mercaptans by Caustic Soda

In Table 7 we have outlined the pertinent physical data on some of the mercaptans present in gasoline. The solubility data were obtained from articles written by Borgstrom,[5, 6] who used large volumes of caustic to determine the comparative solubility of the mercaptans. For this reason these

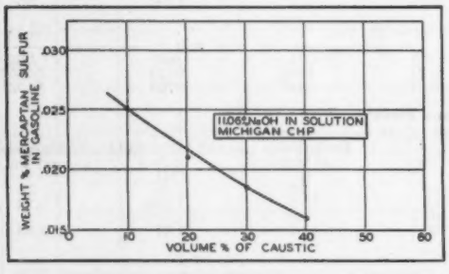


Fig. 3—Influence of volume of wash upon mercaptan removal

data can only be used to determine the comparative solubility and should not be considered as being a quantitative expression of the amount of mercaptan that can be removed by the use of this particular solution of caustic soda. The amount of mercaptan that can be removed by caustic washing depends upon the acidity of the mercaptan, which in turn depends upon the boiling range and structure of the mercaptan. No doubt, a considerable quantity of unsaturate mercaptans is present in cracked gasolines, and we do not have any data covering this type of compound. The extraction involves a two-phase system of naphtha and caustic solution which will contain mercaptan in three forms—free mercaptan dissolved in the oil phase, and sodium mercaptide and mercaptan ions in the caustic phase. The mercaptan ions will predominate.

The equilibrium equation is the familiar expression K = the concentration of the mercaptan in the

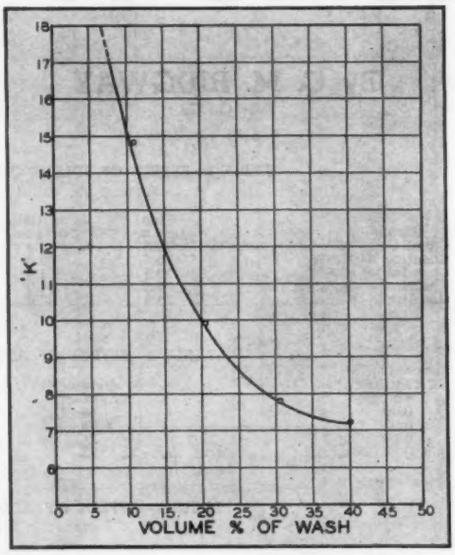


Fig. 4—Influence of volume per cent wash on "K"

caustic phase divided by the concentration of mercaptan in the gasoline phase. The arithmetic value of K is dependent upon the strength of the caustic solution, the temperature of the solution, the volume of the solution, and the amount of mercaptan already present in the oil. This applies, of course, to one single mercaptan in naphtha solution. The arithmetic value of K decreases with the boiling range of the mercaptan in question; hence, the K value that can be realized for a mixture of mercaptans such as occur in gasoline is dependent upon the amount of these mercaptans present in the mixture.

Crary and Holm[6] published an article in the December 1937 issue of Industrial and Engineering Chemistry concerning this particular problem. In this article they presented equations which permit the calculation of the equilibrium between the amount of mercaptan sulfur remaining in the gasoline and a given mercaptan sulfur content in the caustic. These formulae apply to pure mercaptans and are not applicable to mixtures such as we find in gasolines. From these data and others the particular coefficients have been approximated.

Mercaptans—	K
Methyl	200
Ethyl	80
Propyl	20
Butyl	4
Amyl	1

It is to be noted that caustic soda used for the extraction of methyl mercaptan can be used up to the

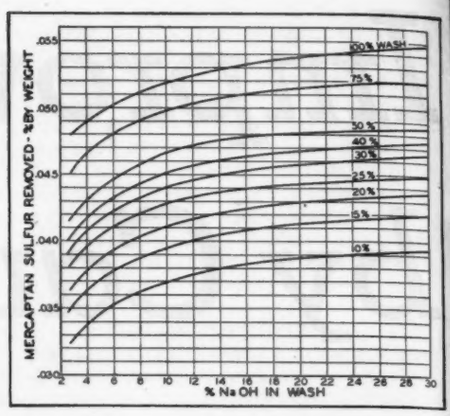


Fig. 6—Influence of caustic strength and volume upon mercaptan sulfur removal

point where an appreciable amount of the caustic has been expended before the extraction efficiency of the caustic decreases to any great extent. However, where it is desired to remove butyl mercaptan, a practically unlimited volume of caustic is required to accomplish this step since the allowable concentration of mercaptan in the caustic is extremely low. The difficulty in removing the high-boiling mercaptans, more particularly those heavier than propyl, is rather well illustrated by the distribution coefficients for 16 Baume caustic where 20 per cent by volume of this reagent is used to extract a particular mercaptan from a naphtha.

Caustic Concentration

The effect of caustic concentration and volume of caustic upon the removal of mercaptan sulfur and, in addition, the effect of step-wise washing and rewashing a sample of Michigan combination high-pressure gasoline with fresh increments of new caustic was investigated. These data, which will be discussed presently, clearly show that satisfactory removal of mercaptan from Michigan combination high-pressure gasoline is very difficult. A further set of experiments was outlined to

(Continued on Page 88)

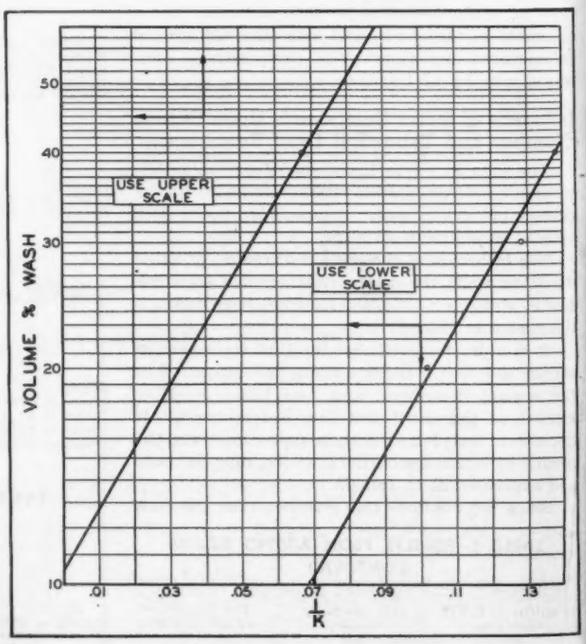


Fig. 5—$\frac{1}{K}$ vs. volume per cent of wash

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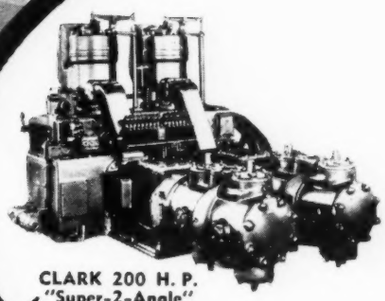

CLARK 200 H. P.
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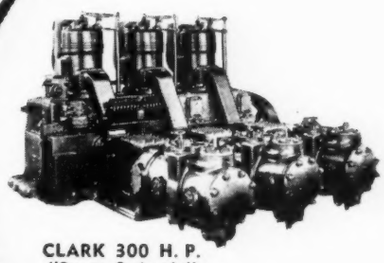

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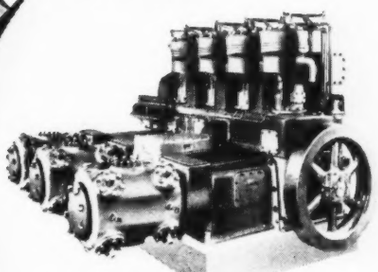

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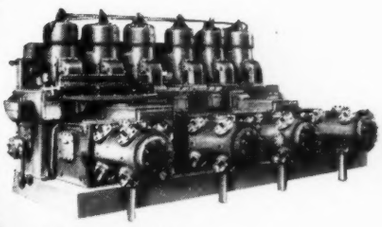

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study the influence of the amount of mercaptan sulfur in the caustic upon the amount of mercaptan that could be extracted from the gasoline.

Influence of Caustic Strength

The work of other investigators, more particularly Birch and Norris,[9] has indicated the fact that more dilute caustic solutions are more economically effective in the removal of sulfur. The weight of mercaptan sulfur removed per pound of caustic by a dilute solution is considerably greater than where a more concentrated solution is used. This is to be expected when the dissociation of caustic solution is taken into consideration. All data confirm these conclusions. This is best illustrated by referring to Figures 1 and 2. In Figure 1 it will be

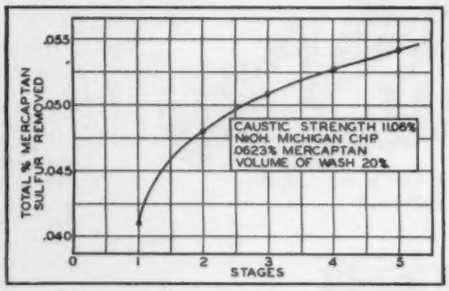

Fig. 7—Influence of multiple wash upon total mercaptan removed

seen that there is no apparent gain in using a solution containing more than 15 per cent of sodium hydroxide. The reason for this is indicated on Figure 2, where the partition coefficient has been plotted against the caustic strength. A K value of 9 is indicated for a 5 per cent solution and is only increased to 11 by increasing the concentration to 28 per cent. However, a given volume of a strong solution of caustic will decrease the mercaptan content of a given gasoline to a lower concentration than will a like volume of weak caustic.

Influence of Volume of Wash Upon Mercaptan Removal

The mechanics of the washing operation wherein two mutually nonmiscible liquids are contacted indicates that an increase in volume of the wash liquid should increase appreciably the amount of mercaptan extracted from the gasoline. In Figure 3 we have plotted the data which

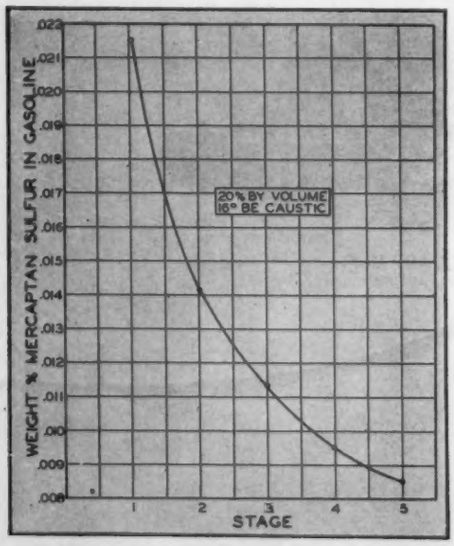

Fig. 8—Influence multi-stage wash upon mercaptan content of caustic washed gasoline

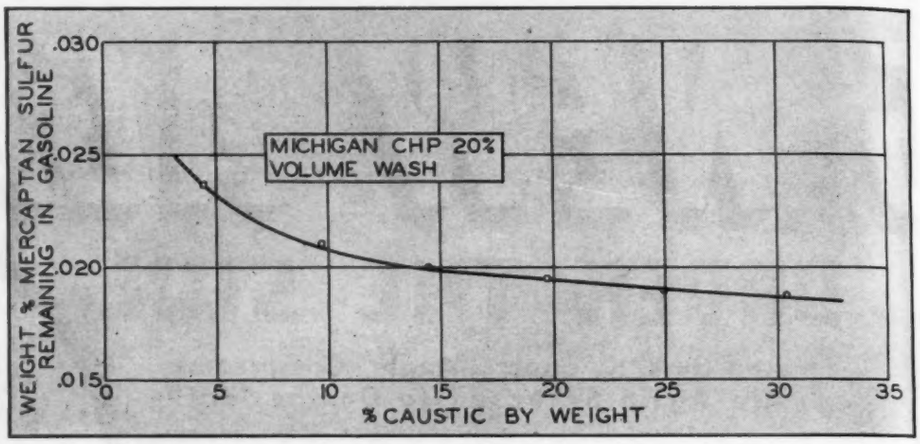

Fig. 9—Influence of multiple wash upon mercaptan removal

show that the amount of mercaptan remaining in the gasoline decreases quite steadily for each incremental increase in the volume of the wash liquid. The influence of the volume of wash upon the K values is shown in Figure 4. The shape of this curve indicated that it could be plotted as a straight line if the proper means were used in presenting the data. We found that these data fall in essentially a straight line (Figure 5) when we plotted the logarithm of the volume of wash against the reciprocal of the K value. This relationship enabled us to extrapolate somewhat beyond the range of the data.

Since the amount of sulfur removed is dependent upon the volume of caustic used, as well as upon the strength of the solution, it was thought advisable to calculate the influence of these two variables upon the mercaptan removal Figure 6 is a result of these calculations. It must be borne in mind that the data above 50 volume per cent of wash water are extrapolated. However, it is felt that the accuracy is sufficient to enable us to draw some fairly definite conclusions from these data. Figure 6 indicates that we have several choices in so far as the extraction of a given amount of mercaptan is concerned. This is shown in tabular form in Table 8. It is quite obvious that the overall cost of extracting a given amount of mercaptan from the gasoline must change when the volume and/or strength of caustic is varied.

Influence of Multiple Washes

All of the information which has been reviewed to the present point indicates the difficulty in decreasing the mercaptan content below .016 per cent by weight by the use of a single wash with fresh caustic. In the beginning it was hoped that the mercaptan content of the gasoline could be reduced to .005 per cent by caustic washing. It is quite obvious, however, that multiple washes must be resorted to to accomplish this end. To determine the influence of a multi-

(Continued on Page 92)

TABLE 7—MERCAPTAN PHYSICAL DATA

Mercaptan—	Boiling pt. (°F.)	Solubility 3.5° Baume caustic	Specific gravity	Lbs./gal.	Vapor pressure @ 70° F. mm. Hg
Methyl	42	97.9	.868	7.22	1,270
Ethyl	97	94.8	.840	7.00	447
N-propyl	154	77.5	.836	6.96	180
Iso-propyl	140	78.5	.809	...	...
N-butyl	208	47.2	.836	6.96	40
Sec-butyl	190	45.3	.825	...	...
N-amyl	259	19.3	.838	..	16
Sec-amyl	243	16.8	.828	...	...
N-hexyl	302	6.3	.849	...	...
Sec-hexyl	288	5.3	...	...	...
N-heptyl	347	1.8	...	...	...
Sec-heptyl	333	1.35	...	...	...
N-octyl	390	0.50	...	...	...
Sec-octyl	375	0.35	...	...	...
N-nonyl	435	0.21	...	...	...
Sec-nonyl	420	0.16	...	...	...

TABLE 8—COMPARISON OF METHODS GIVING EQUIVALENT MERCAPTAN REMOVAL

Per cent mercaptan sulfur removal	1 Vol. % of wash	1 % NaOH	2 Vol. % of wash	2 % NaOH	3 Vol. % of wash	3 % NaOH	4 Vol. % of wash	4 % NaOH	5 Vol. % of wash	5 % NaOH	6 Vol. % of wash	6 % NaOH	7 Vol. % of wash	7 % NaOH
.0325	10	2.6	..	..	..	..	..	..	..	..	..	..	..	..
.0350	10	5.7	15	2.7	..	..	..	..	..	..	..	..	..	..
.0375	10	11.5	15	5.4	20	3.6	..	..	..	..	..	..	..	..
.0400	..	..	15	11.9	20	6.2	25	4 3	30	3 2	40	2 5	..	..
.0425	..	..	..	..	20	16.2	25	8 8	30	6 2	40	4 9	50	3 3
.0450	..	..	..	..	..	..	..	..	30	14 4	40	9 6	50	6 6
.0475	..	..	..	..	..	..	..	..	..	..	40	30 0	50	14 0
.0500	..	..	..	..	..	..	..	..	..	..	..	..	..	..

TABLE 9—K VALUES

Multiple Washing With 20% of 16° Baume Caustic

	Stages 1	2	3	4	5
K	9 95	2 58	1 18	1 00	0 505
Per cent sulfur removed	65 60	11 7	4 35	3 05	1 440
Per cent total removal	76 20	13 6	5 00	3 50	1 700

Influence Caustic Concentration Using 20% by Volume of Caustic

Be. gravity of caustic	7	14 5	16	20 7	26 8	31 5	36 5
Lb. NaOH/gal.	0 40	0 905	1 03	1 41	2 05	2 69	3 37
Per cent NaOH by wt.	4 4	9 9	11 06	14 6	19 8	25 0	30 4
K	8 95	9 9	9 95	10 6	10 9	11 15	11 75
Per cent sulfur removed	62	66 5	65 6	67.9	68 6	69 5	70 2

Influence of Caustic Volume Using 16° Baume Caustic

Volue of wash, per cent	10	20	30	40
K	14 8	9 9	7 82	7 3
Per cent sulfur removed	59 7	66 5	70.2	74 5

# of Testing per year

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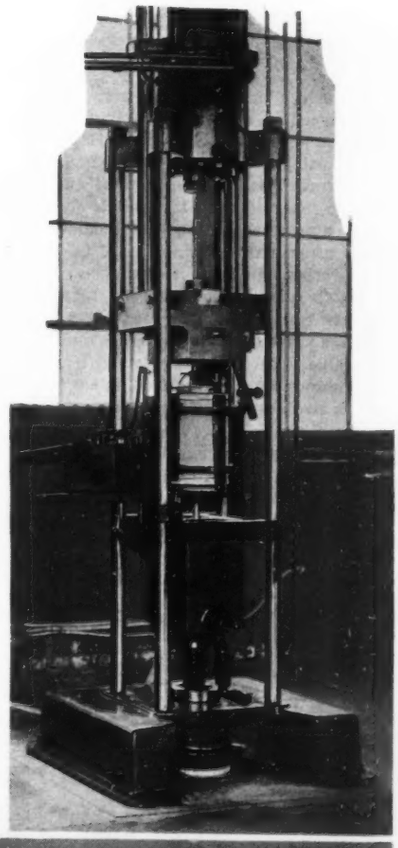

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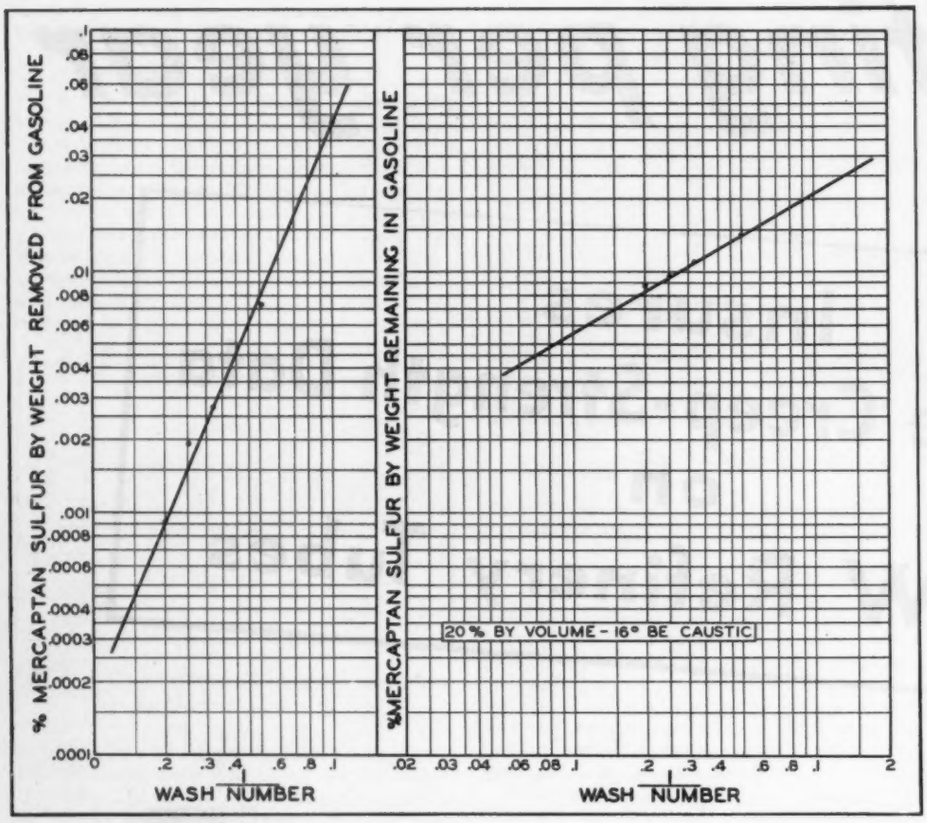

% MERCAPTAN SULFUR BY WEIGHT REMOVED FROM GASOLINE
%MERCAPTAN SULFUR BY WEIGHT REMAINING IN GASOLINE
20 % BY VOLUME - 16° BE CAUSTIC
WASH NUMBER
WASH NUMBER

Figure 10

ple wash, a sample of the same gasoline used in the preceding experiments was washed five times with 20 per cent by volume of 11 per cent caustic soda, using fresh soda for each wash.

Figure 7 indicates the total amount of mercaptan removed from the caustic after each wash. It is apparent that the total amount extracted, even after many washes, must be less than the total mercaptan content of the raw gasoline. This point is further illustrated by plotting the mercaptan content of the gasoline following each wash, as was done in Figures 8 and 9. After considerable experimentation it was learned that the data shown on Figures 7, 8 and 9 could be plotted as straight lines if appropriate measures were resorted to.

No doubt the extrapolated data from the curves on Figure 10 should be used with considerable caution, since the K values which are indicated in Table 3 are dropped so rapidly for each wash. If we consider these curves to be sufficiently accurate for our purpose, we find that 12 washes with fresh caustic would be required to lower the mercaptan content of this particular sample of gasoline to .005 per cent. It is quite obvious that this could not be justified, since the operating and chemical costs would be prohibitive. When it became apparent that the mercaptan content of this gasoline and the nature of the mercaptans present in it were such that difficulty would be encountered in removing a sufficient amount of mercaptans without excessive chemical cost, it was decided to study the influence of the concentration of mercaptan sulfur in the caustic upon the mercaptan sulfur content of the washed gasoline.

Michigan combination high-pressure gasoline having a mercaptan content of approximately .05 per cent mercaptan sulfur by weight was washed with 20 per cent by volume of 16 Baume caustic. The caustic from this wash was then used to wash another batch of gasoline and the process repeated until this caustic had been used in some 20 washes.

The mercaptan content of the gasoline was determined from the samples and the mercaptan content of the caustic calculated from these analyses. The results of these determinations and calculations are shown in Table 10. A portion of these data is plotted on Figure 11, more particularly that part showing the relationship between the wash number and per cent remaining in the gasoline, per cent mercaptan in the caustic, and the mercaptan removed from the gasoline. The

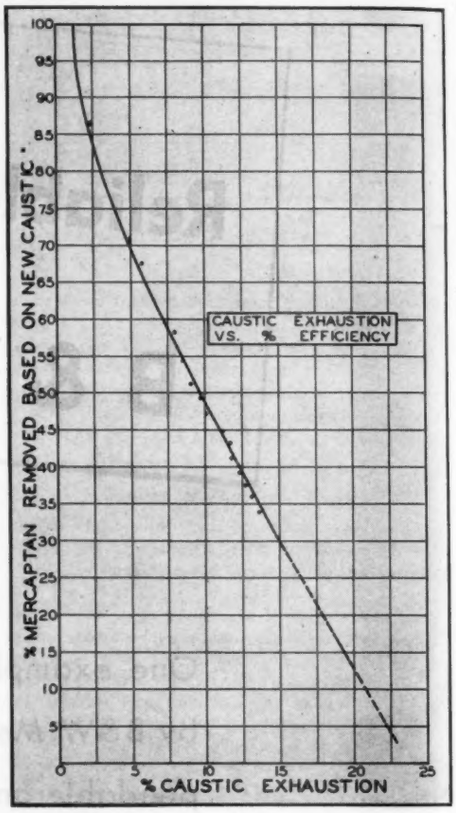


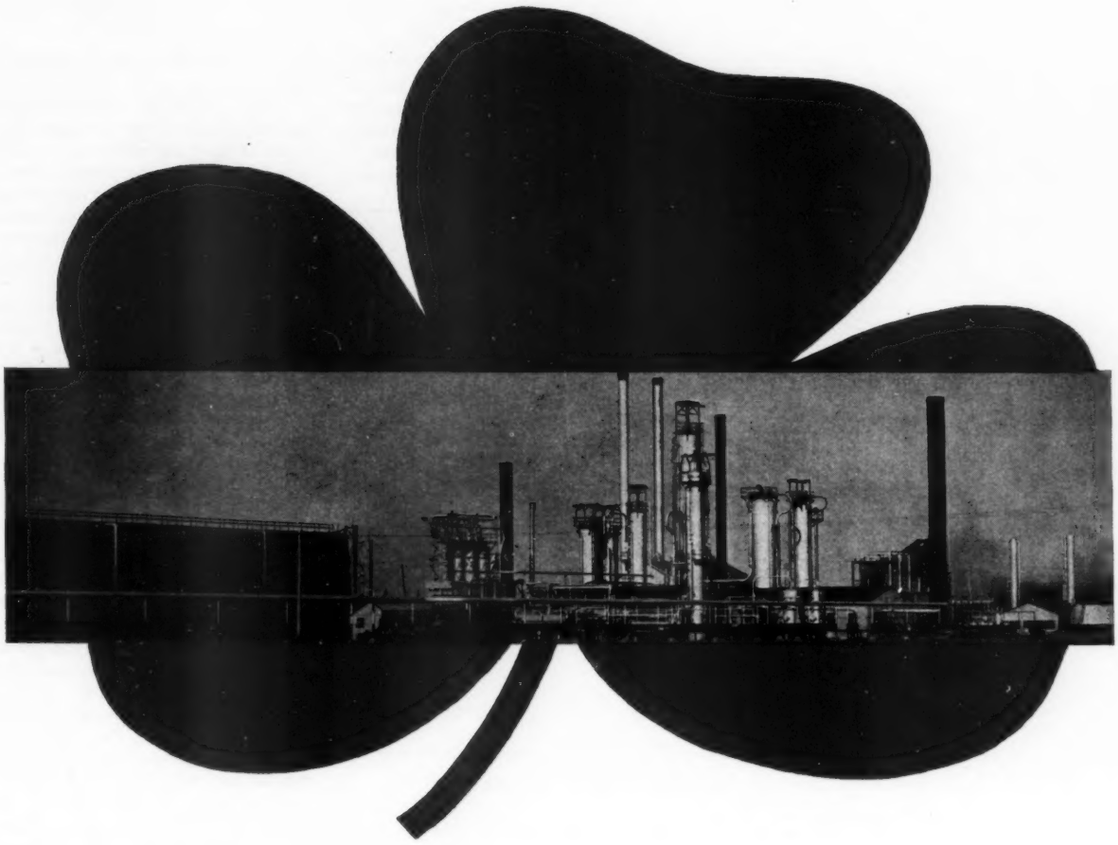
Fig. 13—Successive use of caustic for removing mercaptans from Michigan CHP gasoline

breaks in the curve representing the mercaptan content of the gasoline are important. This perhaps is due to a change in the particular mercaptan being extracted. Examination of Table 4 indicates that these breaks occur where there is a change in the partition coefficient. It is to be noted that if these curves are extended there is an indication that the caustic will no longer be effective for the removal of any mercaptan after the thirty-sixth wash.

In Figure 12 we have shown the relationship

TABLE 10—THE INFLUENCE OF USING PARTIALLY SPENT CAUSTIC ON MERCAPTAN SULFUR REMOVAL

Wash No.:	Mercaptan sulfur % by wt.			Lbs. mercaptan sulfur/gal.			Total mercaptan sulfur taken up by caustic	Per cent exhaustion of caustic	Efficiency of this wash based upon fresh caustic as in No. 1 wash	Caustic consumption if caustic discarded at this point lbs./bbl. gasoline	Partition coefficient	Caustic consumption lbs. NaOH per lb. of sulfur removed
	Raw gasoline	Washed gasoline	Dissolved in caustic	In washed gasoline	In caustic	Removed this wash						
1	0 0507	0 0174	0 0333	0.00102	0 00980	0 00196	0 00196	1 19	100 00	8 65	9 6	105 0
2	0 0507	0 0219	0 0288	0.00129	0 01825	0 00169	0 00365	2 22	86 5	4.33	14.2	56 5
3	0 0507	0 0242	0 0265	0.00142	0 02605	0 00156	0 00521	3 18	79 5	2 88	18 3	39 5
4	0 0507	0 0257	0.0250	0.00151	0 03340	0.00147	0 00668	4.05	75.0	2 16	22 1	30 9
5	0 0507	0 0269	0 0238	0.00158	0 04040	0 00140	0 00808	4 9	70 8	1 73	25 6	25 5
6	0 0507	0 0282	0 0225	0.00166	0 04700	0 00132	0 00940	5 84	67 5	1 44	28.2	21 9
7	0 0507	0 0291	0 0216	0 00171	0 05335	0 00127	0 01067	6 36	64 8	1 23	31.1	19 3
8	0 0507	0 0305	0.0202	0.00180	0 05925	0 00118	0 01185	7.22	60.6	1.08	32.9	17.4
9	0 0507	0 0313	0 0194	0 00184	0 06495	0 00114	0 01299	7 91	58 2	0.96	35.3	15 9
10	0 0507	0 0326	0.0181	0.00192	0 07025	0 00106	0 01405	8.55	54 4	0 87	36.6	14 7
11	0 0507	0 0336	0.0171	0.00197	0.07530	0 00101	0 01506	9.15	51.4	0.79	38.2	13 7
12	0 0507	0 0342	0.0165	0.00201	0 08015	0 00097	0 01603	9 75	49.5	0.72	39.8	12 9
13	0 0507	0 0350	0 0157	0.00204	0 08485	0 00094	0 01697	10.3	47.2	0.67	41.5	12.1
14	0 0507	0.0357	0.0150	0.00209	0 08980	0 00099	0 01796	10.9	45.0	0.62	43.0	11.6
15	0 0507	0 0363	0 0144	0 00213	0 09405	0 00085	0 01881	11.4	43.2	0.58	44.0	11.0
16	0 0507	0 03695	0 01375	0.00217	0 09810	0 00081	0 01962	11.9	41.3	0.54	45.3	10.5
17	0 0507	0 0376	0.0131	0.00221	0.10195	0.00077	0 02039	12 4	39.3	0.51	46.1	10.1
18	0 0507	0 0382	0 0125	0.00224	0.10565	0 00074	0 02113	12.8	37.5	0.48	47.1	9.8
19	0 0507	0 0387	0 0120	0 00227	0.10920	0 00071	0 02184	13.2	36 0	0.46	48.1	9 4
20	0 0507	0.0394	0 0113	0 00231	0.11255	0 00067	0 02251	13.7	33.9	0.43	48.3	9 2



A SHAMROCK HAS 3 LEAVES!

Likewise, the erection of a gasoline plant has three important phases each of which must be in perfect harmony and balance with the other two. Recognizing this vital fact, it has always been our policy to match **sound engineering** with **correct design** and, in turn, to equal these two with **quality construction.**

Rigid adherence to this policy by The Stearns-Roger Manufacturing Company and Parkhill-Wade has resulted in the growth of cordial relations with our clients that increase with each passing year.

In example, the highly valued relations existing between our two firms and The Shamrock Oil and Gas Corporation began more than four years ago with the engineering, design and construction of their original absorption plant in Moore County near Dumas, Texas which was built for a capacity of 40,000,000 cubic feet of natural gas per day at 375 pounds gauge. It is a matter of great pride to us that when this plant was later enlarged for a capacity of 80,000,000 cubic feet and finally enlarged for a capacity of 240,000,000 cubic feet per day at 375 pounds gauge ... and still later when the Polymerization unit was added ... the services of our two firms were again employed.

★

NATURAL GASOLINE PLANTS
GAS DEHYDRATION UNITS WITH CALCIUM CHLORIDE, GLYCERINE or DIETHYLENE GLYCOL CYCLES
STABILIZATION PLANTS

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BUTANE PRODUCTION PLANTS
BUTANE STORAGE AND HANDLING EQUIPMENT
DUST AND LIQUID SCRUBBERS

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between the mercaptan content of the caustic and the mercaptan content of the gasoline. In Figure 13 is plotted the per cent mercaptan removed from the gasoline versus the per cent exhaustion of the caustic. Apparently the caustic no longer will remove mercaptans from this particular stock when it is 25 per cent exhausted. These data make it possible to determine with reasonable accuracy the limits of caustic exhaustion which can be used in the plant, and to a certain extent predict the number of stages required to remove a given amount of mercaptan.

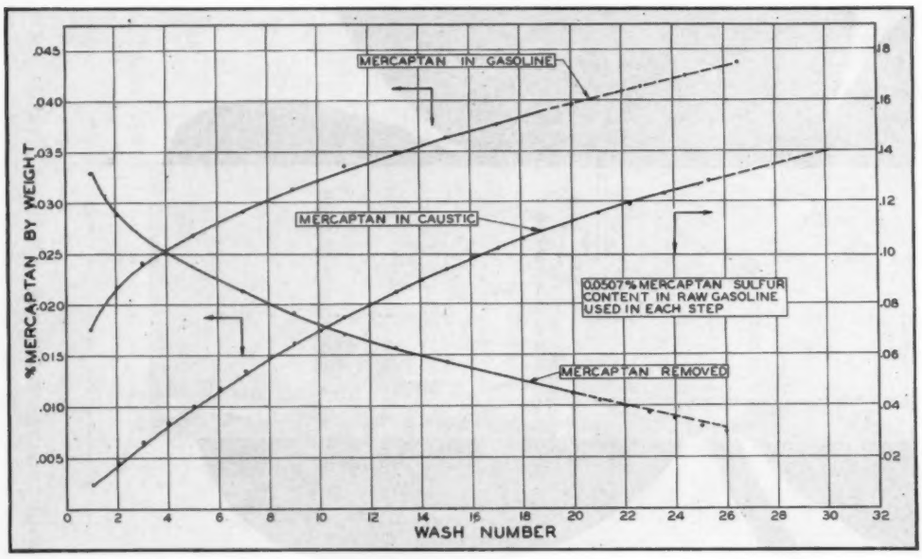
MERCAPTAN IN GASOLINE
MERCAPTAN IN CAUSTIC
0.0507% MERCAPTAN SULFUR CONTENT IN RAW GASOLINE USED IN EACH STEP
MERCAPTAN REMOVED
% MERCAPTAN BY WEIGHT
WASH NUMBER

Fig. 11—Caustic washing Michigan CHP gasoline with 16° Be. caustic

Conclusion

All of the information available at the present time indicates an appreciable saving in tetraethyl lead can be realized by the removal of sulfur compounds. It is also apparent that caustic soda can be used for the extraction of mercaptans and that the volume, concentration; and temperature of the caustic soda are very important. The amount of mercaptan sulfur that can be removed and the effect of its removal upon the tetraethyl lead response of the gasoline depends upon the type of mercaptans present and the nature of the motor fuel. Hence, the economic advantage of caustic washing gasolines must be determined for each individual stock by evaluating the influence of the above mentioned factors. In closing, it might be well to point out that it is most difficult, if not impossible, to conduct batch-treating operations without experiencing a loss of light ends, so that a serious error is introduced when an effort is made to determine comparative tetraethyl lead responses of gasolines so treated. Our experience indicates that a closed continuous counter-current system must be used for this work.

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REFINERY GAS

(Continued from Page 79)

separation of liquid and vapor is effected. The evaporator overhead vapors flow from the vapor-phase cracking furnace and are thermally decomposed, after which they are introduced into the base of the light-oil fractionating tower for separation of fuel.

Overhead cracked gasoline from the light-oil fractionator, polymerized gasoline, and non-condensible gas flow to a Gray vapor-phase treating unit of four towers. Treated vapors leaving the clay chambers flow to an after-fractionator, from which the overhead gasoline vapors may be regulated to endpoint specifications by means of reflux control. The gasoline condensate is stabilized to gasoline specifications and blended with the straightrun gasoline previously mentioned. The gas from the Gray after-fractionator accumulator passes through a gas-scrubber where hydrogen sulfide is removed by caustic. The treated gas is compressed and makes up liquid charge stock for the polymerization unit. This condensate is charged to the polymerization furnace, where thermal decomposition and polymerization of the gaseous products take place.

In order that the finished gasoline may meet doctor specifications, stabilized, treated, endpoint, cracked and polymerized gasolines are blended with the straightrun gasoline and charged to the doctor treating plan to complete the cycle.

Despite the abundance of attention directed to production of higher-octane gasoline, developments have also taken place in distillation for recovery of lube distillates. A company in Texas has been operating a two-stage plant, built by Alco, for several months which is typical of the flexibility obtainable in this phase of refining. The Texas unit has a capacity of about 15,000 bbls. of crude oil per day and was designed to process East Texas crude to a residum of approximately 50 per cent and alternately processing Mirando crude to a residue of about 5 per cent, simultaneously recovering lubricating oil fractions at low absolute pressure.

Install Two Towers

In order to obtain this degree of flexibility, the secondary tower was designed for operation at either atmospheric pressure or under high vacuum. In order to operate the major items of equipment at substantially uniform load for the alternative conditions, consideration was given to balancing the heat-exchanger duty with the furnace load to obtain a uniform heat input. The method of reflux control on the secondary tower gives uniformity of operation by giving a high degree of preheat for either condition, and at the same time permits low pressure drop for wide variations in the operating conditions.

The tube still in the Texas plant is of the radiant and convection type with separately fired radiant sections for close control of heat input for the primary and secondary stages. This design gives a higher overall economy as the flue gas from both sections flows over the entire convection surface giving a lower flue gas outlet temperature for the two-stage operation than would otherwise obtain.

Both fractionating towers are equipped with sufficient trays above the inlet to insure adequate fractionation of the various products. Streamline flow of both liquid and vapor results in low pressure drops, giving a minimum back pressure at the flashpoint. With this design positive liquid distribution is secured for all liquid rates, with short-circuiting and unequal distribution eliminated. As the number of trays between streams can be varied at will for different operating conditions, the maximum degree of fractionation with a minimum amount of process steam is obtained.

The unit charges 15,000 bbls. stream day of 38-degree A.P.I. East Texas crude. There is obtained 25 per cent gasoline, 10 per cent of Stoddard solvent and 15 per cent of furnace oil from the fractionating tower. The residuum, amounting to 50 per cent, is charged to the vacuum section of the unit for further processing.

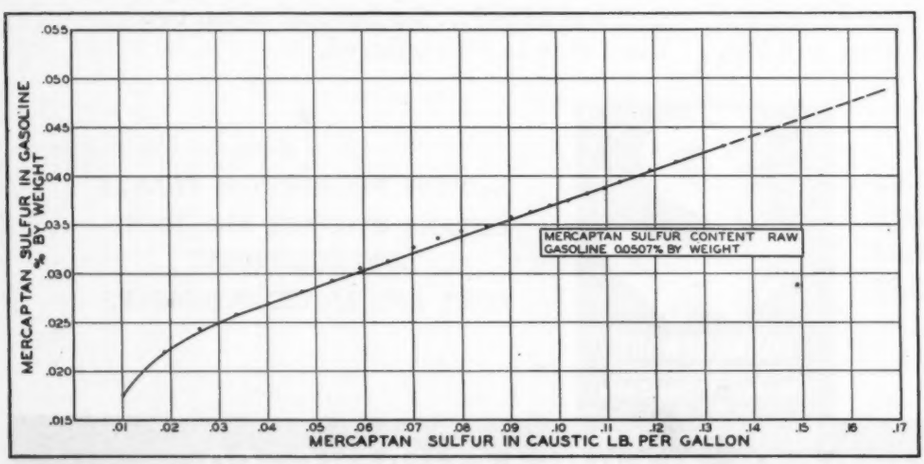
MERCAPTAN SULFUR CONTENT RAW GASOLINE 0.0507% BY WEIGHT
MERCAPTAN SULFUR IN GASOLINE % BY WEIGHT
MERCAPTAN SULFUR IN CAUSTIC LB. PER GALLON

Fig. 12—Caustic washing Michigan CHP gasoline successive use of caustic on fresh raw gasoline. Per cent mercaptan in gasoline versus pounds mercaptan sulfur in caustic

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Adequate Stocks in All Active Fields

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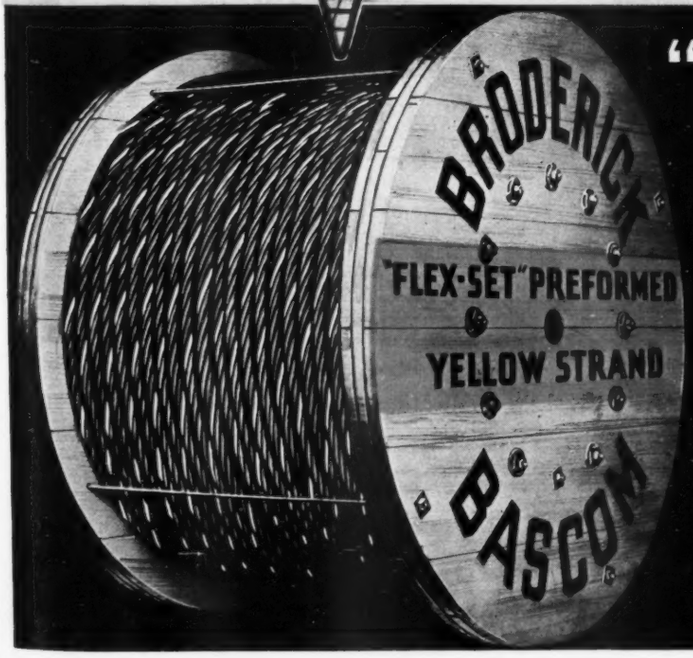
V-11



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Methyl N-Butyl Ketone as a Dewaxing Solvent

By O. S. POKORNY and R. K. STRATFORD
Imperial Oil, Ltd.

The most outstanding development in the petroleum industry is the rapid growth in the employment of solvents for the purpose of refining and dewaxing lubricating stocks. In view of the fact that the fundamental principles involved in dewaxing with two solvents were well understood prior to 1890, the solvent dewaxing processes now undergoing a rapid expansion might be classed as one of the forgotten and later rediscovered arts. Although solvent properties of a number of wax precipitants and diluents or solvents for oil were published in the literature prior to 1906, the first commercially successful Grover's process[1] was developed only a little over 10 years ago, when improvements in stripping technique, resulting from the introduction of pipe stills and bubble towers, made possible the economical recovery of the solvents employed.

Active search for a suitable dewaxing solvent has followed three principal directions:

1. Centrifuging the wax from a solution of waxy oil in solvent, or a mixture of solvents, characterized by a relatively high specific gravity (heavier than water).

2. Filtering the wax from a solution in a "self-refrigeration" solvent.

3. Filtering the wax from a solution in a solvent or a mixture of solvents which are chemically stable and noncorrosive, and in which paraffin waxes are substantially insoluble so that the pourpoint of dewaxed oil will be very close to the dewaxing temperature, if not lower.

In studying solvents suitable for dewaxing in this laboratory the last three years, a general survey of the solubility characteristics led to observations which can be briefly summarized as follows:

1. For oil ranging in viscosity from 50 to 200 S.U. Sec. at 210° F., the pourpoint of the dewaxed oil is a function of the total solubility of wax at the dewaxing temperature in the volume of solvent employed. As shown in Figure 1, this relationship applies to both raw as well as solvent extracted distillates and residuals for dilutions ranging from 1.25 to 5.0 : 1.0, the agreement being doubtless all that could be expected in view of the experimental errors in determining solubilities and solidification temperatures.

2. Branching of chains (isomerism) in the solvent tends to raise the miscibility temperature from 15 to 35° F., while the decrease in the wax

[1]Indian Refining Co., Lawrenceville, Ill., 1927, employing benzol-acetone.

FIG. 1 - RELATIONSHIP BETWEEN THE TOTAL SOLUBILITY OF WAX IN THE VOLUME OF SOLVENT EMPLOYED FOR DILUTION AND THE SOLIDIFICATION POINT OF DEWAXED OIL

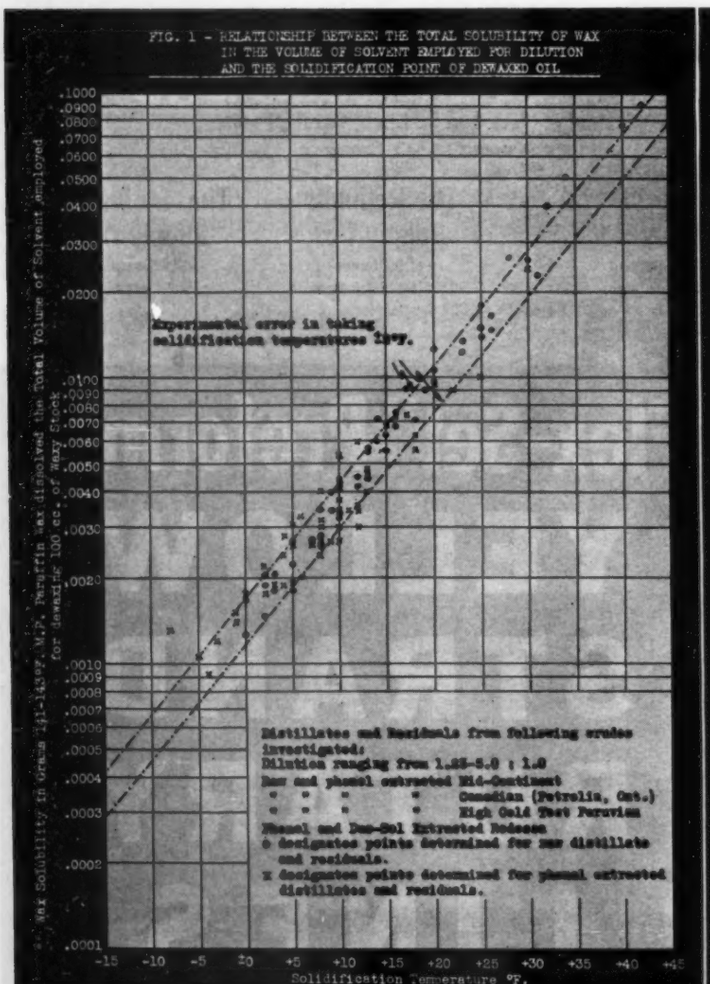
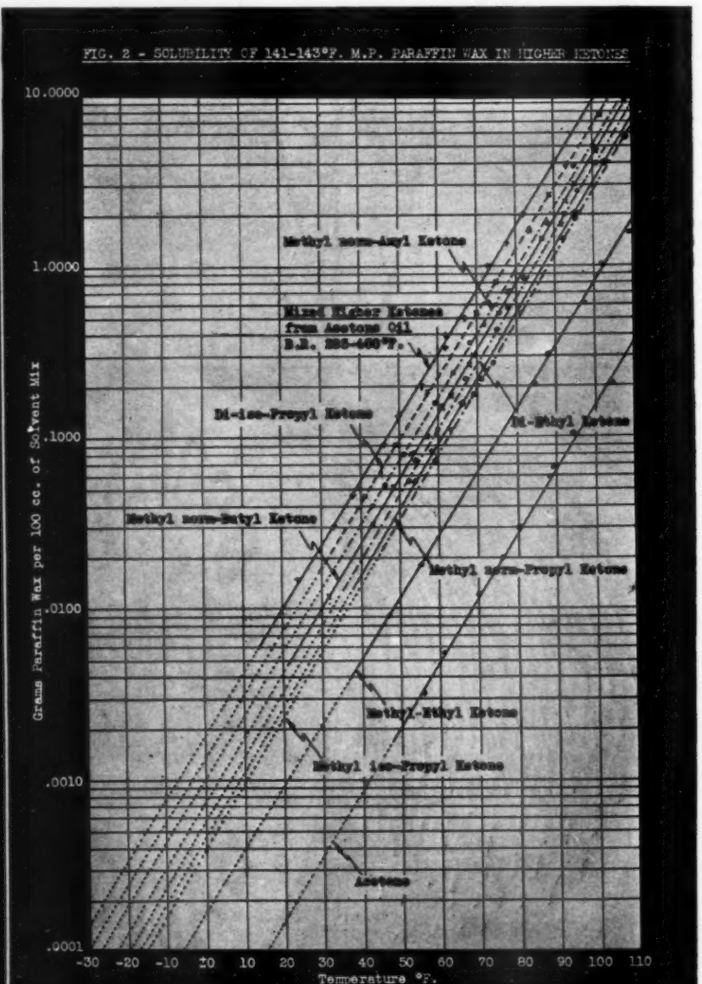

Wax Solubility in Grams 141-143°F. M.P. Paraffin wax dissolved the Total Volume of Solvent employed for dewaxing 100 cc. of Waxy Stock
Experimental error in taking solidification temperatures ±1°F.
Distillates and Residuals from following crudes investigated:
Dilution ranging from 1.25-5.0 : 1.0
Raw and phenol extracted Mid-Continent
" " " " Canadian (Petrolia, Ont.)
" " " " High Cold Test Peruvian
Phenol and Duo-Sol Extracted Redwood
o designates points determined for raw distillate and residuals.
x designates points determined for phenol extracted distillates and residuals.
Solidification Temperature °F.

FIG. 2 - SOLUBILITY OF 141-143°F. M.P. PARAFFIN WAX IN HIGHER KETONES



solubility is insignificant from the practical point of view.

3. The filtrability of the wax (solution throughputs) is influenced by the following factors:

(a) Origin of the waxy stock, whether distillate or residuals, and its wax content for the desired pour temperature.

(b) Viscosity and type of solvent employed.

(c) Dilution.

(d) Rate of chilling.

The results of these experimental studies indicated that a distinctly superior dewaxing solvent may be found in the group of higher mixed aliphatic ketones, some of which were disclosed in A. Mailhe's French Patent No. 30,634, issued in 1926, for the purpose of removing wax from a lignite extract. Wax solubility and filtrability data indicated that methyl n-butyl ketone produced from secondary hexyl alcohol—a by-product of the oil industry—possesses the necessary characteristics of an ideal dewaxing solvent from the following points of view:

1. Solubility of wax in the solvent.
2. Miscibility temperature of oil and solvent.
3. Rate of filtration.
4. Difference between dewaxing and pour temperatures.
5. Recovery of the solvent.
6. Stability and corrosive characteristics at high temperature.
7. Inflammability of solvent.
8. Toxicity of the solvent.
9. Cost of the solvent.

1. and 2. Solubility of Wax in the Solvent and Miscibility With the Oil:

The wax solubility data for various ketones are shown in Figure 2. It can be seen that the solubility of 141 to 143° F. m.p. wax in methyl n-butyl ketone is comparatively low so that this ketone should act as an excellent precipitant for paraffin wax. So far as dewaxing is concerned, these data must be supplemented by taking into account the miscibility temperature of oil and solvent, shown in the following table:

MISCIBILITY TEMPERATURE OF PHENOL TREATED HEAVY MID-CONTINENT DISTILLATE, VISCOSITY 125 S.U. SEC. @ 210° F., DILUTION 2:1

Ketone—	Miscibility temp., °F.
Methyl ethyl ketone	+78
Methyl n-propyl ketone	+11
Methyl iso-butyl ketone	—14
Methyl n-butyl ketone	—38
Methyl n-amyl ketone	below —40
Di-isopropyl ketone	below —40

Taking into consideration the above wax solubility and miscibility data, it is evident that methyl n-butyl ketone appears to be an excellent precipitant for paraffin wax, the miscibility temperature being sufficiently low to prevent a phase separation at the lower "skin" temperatures encountered in the chilling equipment.

Figure 3 shows the solubility of 141 to 143° F. melting point paraffin wax in a number of dewaxing solvents, including methyl n-butyl ketone. As may be seen from the graph, the solubility of this wax in methyl n-butyl ketone is comparatively low, so that this ketone should act as an excellent precipitant for paraffin wax. Because of the low solubility, a comparatively high dewaxing temperature may be employed to obtain a given pourpoint.

3. Rate of Filtration:

As mentioned previously, viscosity of the solvent and branching of chains has a profound effect on the filtrability of the wax. Figure 4 shows the effect of various ketones on the solution throughput when dewaxing Mid-Continent paraffin slop (74 S.U. Sec. at 210° F.) in a 1.5 : 1.0 dilution at a temperature of the order of 15° F. This data clearly indicates that higher homologues of the ketone series are less interesting as dewaxing solvents in view of the decreasing filtrability of the precipitated wax. It also indicates that the presence of a secondary alcohol is highly undesirable in view of its action in slowing up the filtration.

With a given stock, the rate of filtration and chilling depends largely on the chilling rate and dilution.

(a) Chilling Rate:

The chilling rate has a profound effect upon the filtering rate, as may be seen from the following table:

EFFECT OF CHILLING RATE ON SOLUTION THROUGHPUT MID-CONTINENT PARAFFIN SLOP 70/75 S.U. AT 210° F. DILUTION 1.5:1. FILTERING TEMP. 15° F.

Chilling method—	U. S. gallons of solution/ sq. ft./min.
1° F. per minute	0 445
3° F. per minute	0 245
Shock chilling	0 210

From this table it is seen that uniform chilling of 1 degree per minute is greatly to be preferred to shock chilling. Uniform chilling, in itself, is not sufficient, as the uniform rate of 3 degrees per minute was only slightly better than shock chilling.

(b) Dilution:

The effect of dilution may be seen in the following table:

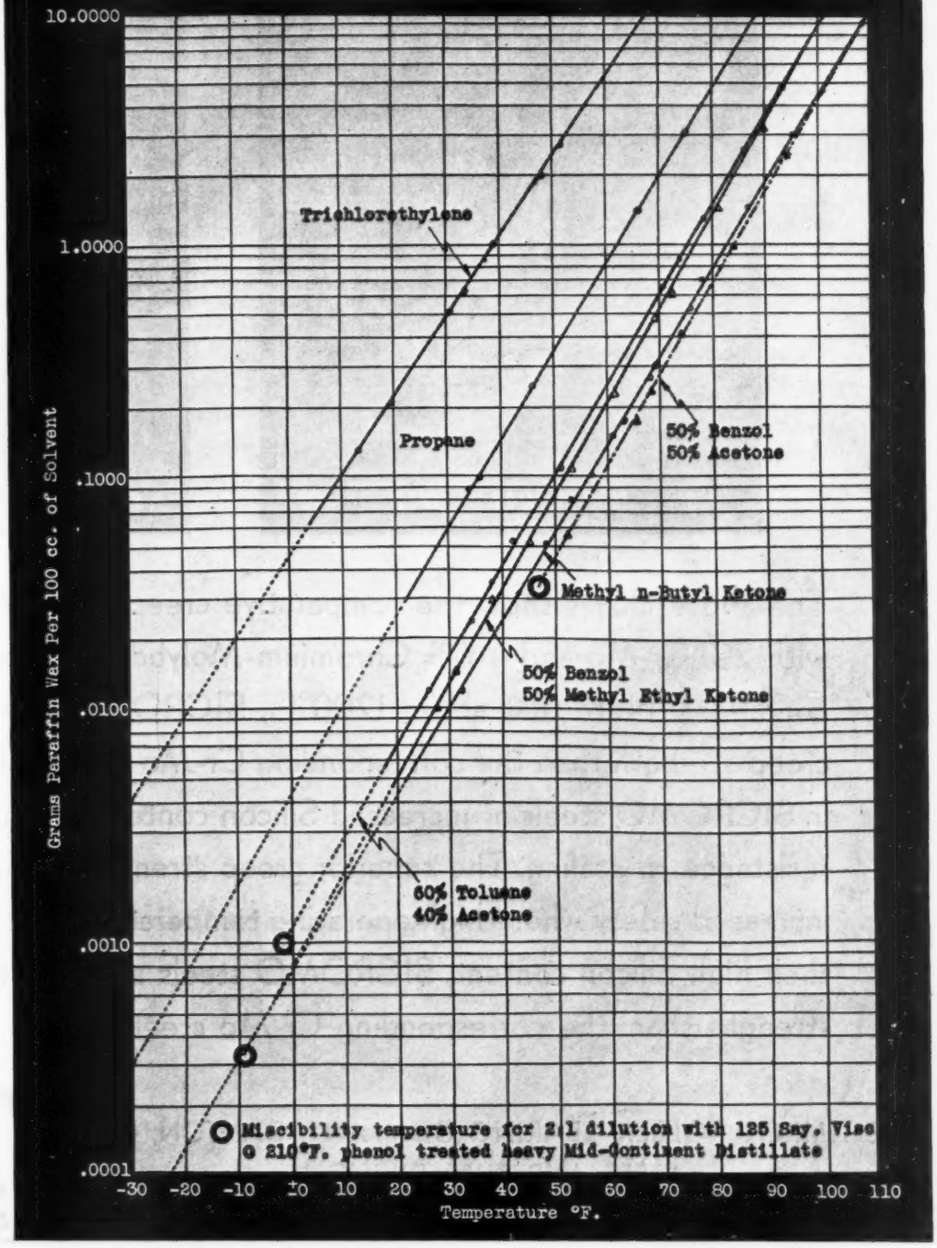
FILTERING MID-CONTINENT HEAVY PARAFFIN DISTILLATE 240/250 S.U. AT 100° F. METHYL n-BUTYL KETONE FILTERING AT 12° F.

Dilution—	U. S. gals./ sq. ft./hr.*
1.25:1	4 50
1.5:1	5 06
1.75:1	5 75
2.0:1	6 51

*This rate is based on filtration through a rotary vacuum filter, for constant thickness of wax cake and washing for constant yield of oil.

The above table shows that as the dilution is increased, the dewaxed oil throughput increases. One of the attractive features of n-butyl ketone

FIG. 3 - SOLUBILITY OF 141-143°F. M.P. PARAFFIN WAX IN VARIOUS DEWAXING SOLVENTS

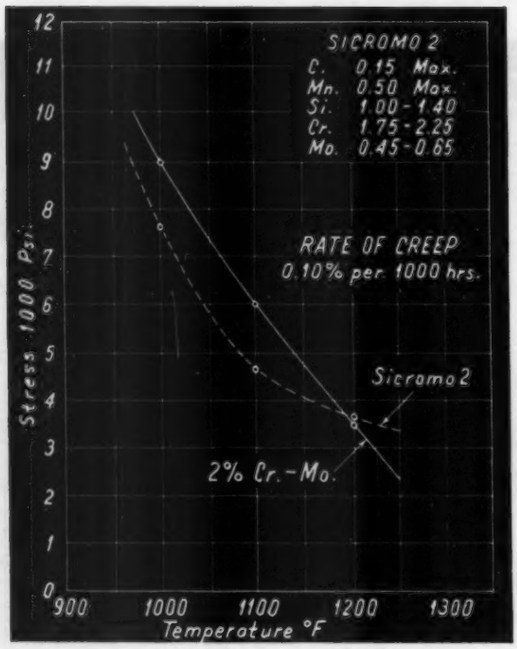


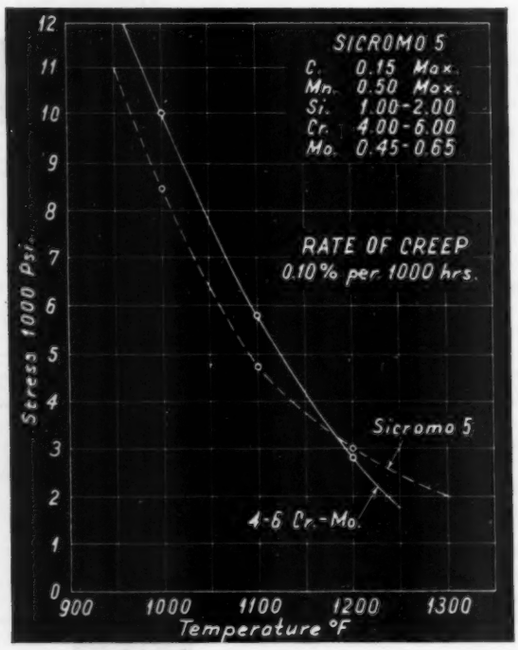
The Characteristics of SICROMO Steels
FOR REFINERY TUBES

CHEMICAL SPECIFICATIONS

	C	Mn.	Si.	Cr.	Mo.
SICROMO 1 —	0.15 Max.	0.50 Max.	1.00 - 1.40	0.75 - 1.25	0.45 - 0.65
SICROMO 2 —	0.15 Max.	0.50 Max.	1.00 - 1.40	1.75 - 2.25	0.45 - 0.65
SICROMO 3 —	0.15 Max.	0.50 Max.	1.00 - 1.40	2.75 - 3.25	0.45 - 0.65
SICROMO 5 —	0.15 Max.	0.50 Max.	1.00 - 2.00	4.00 - 6.00	0.45 - 0.65

STRENGTH





The above charts show the comparative creep strength of SICROMO 2 and 5 with 2% Cr-Mo and 4-6% Chromium-Molybdenum steel tested under identical conditions. Note that above 1200°F., SICROMO 2 and 5 show much greater creep strength than the corresponding Cr-Mo steels. This is due to the presence in SICROMO steels of increased Silicon content which gives them much greater resistance to scaling. The superior creep strength of SICROMO steels assures increased safety where high operating temperatures are encountered. Because of their high Silicon content, SICROMO steels also possess greater stress-rupture strength than the corresponding Cr-Mo steel at high operating temperatures.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
STEEL AND TUBE DIVISION

TIMKEN
SEAMLESS STEEL TUBES

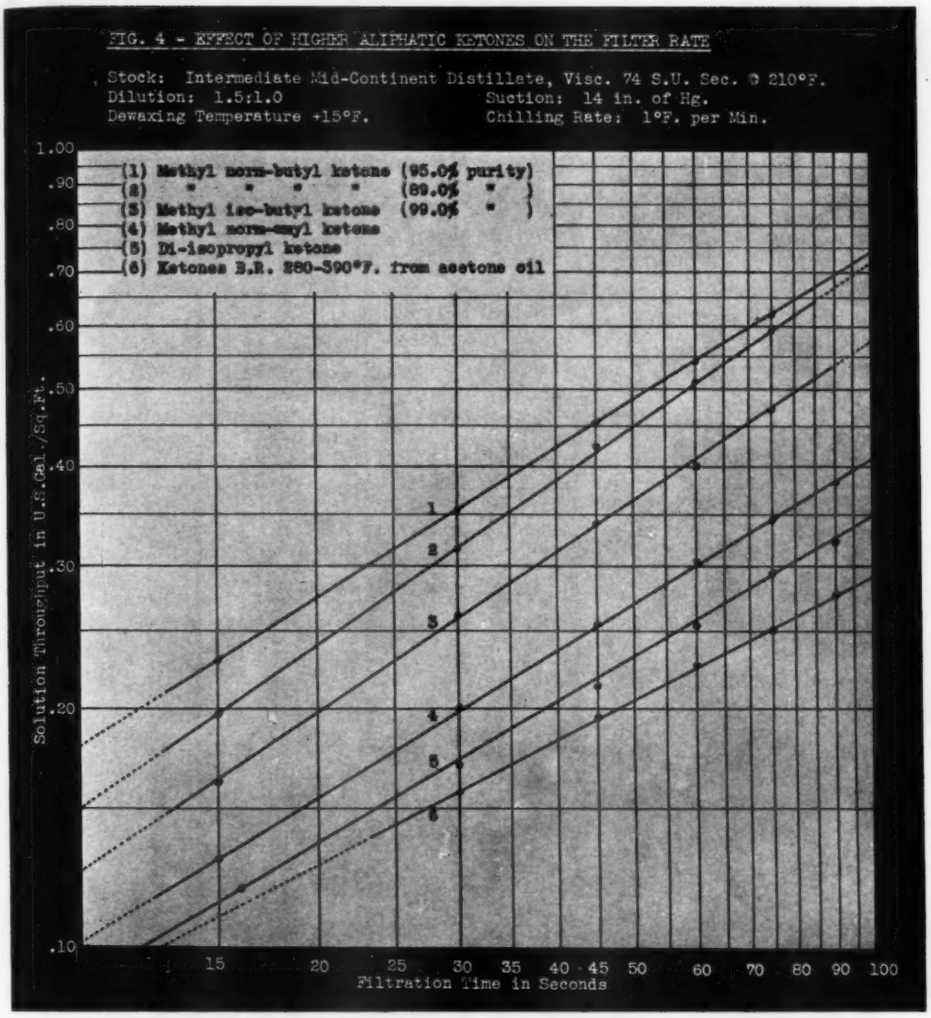


FIG. 4 - EFFECT OF HIGHER ALIPHATIC KETONES ON THE FILTER RATE
Stock: Intermediate Mid-Continent Distillate, Visc. 74 S.U. Sec. @ 210°F.
Dilution: 1.5:1.0
Suction: 14 in. of Hg.
Dewaxing Temperature +15°F.
Chilling Rate: 1°F. per Min.
(1) Methyl norm-butyl ketone (95.0% purity)
(2) " " " " (89.0% ")
(3) Methyl iso-butyl ketone (99.0% ")
(4) Methyl norm-amyl ketone
(5) Di-isopropyl ketone
(6) Ketones B.R. 280-300°F. from acetone oil
Solution Throughput in U.S.Gal./Sq.Ft.
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.10
15 20 25 30 35 40 45 50 60 70 80 90 100
Filtration Time in Seconds

as a solvent for dewaxing purposes is the higher filter rate obtained at relatively low dilutions.

4. Difference Between Dewaxing and Pour Temperatures:

A number of experiments on Mid-Continent distillates has shown that the dewaxed oil has a pourpoint in many cases lower than the dewaxing temperature. This in line with the data presented in Figures No. 2 and 3, which showed that the solubility of 141 to 143° F. m.p. wax at dewaxing temperatures was extremely low. The fact that a comparatively high dewaxing temperature may be employed to obtain a given cold test is of considerable importance from both the installation and operation points of view, as it indicates that a minimum of refrigeration will be required.

5. Recovery of the Solvent:

Methyl n-butyl ketone boils at 258° F. This temperature is such that either atmospheric or vacuum distillation methods of recovery (or both) may be applied without difficulty, whilst separation from oil is a simple matter. At 77° F. 100 parts of water dissolve only 0.42 part of methyl n-butyl ketone. This solubility is low enough to permit a limited amount of steam stripping entailing too great a loss. At ordinary temperature the vapor pressure is low enough (10 mm. at 68° F.), so that evaporation losses will be slight. From lengthy experience in the use of phenol as a selective solvent, it is believed that the overall ketone loss in a dewaxing plant will be very low.

6. Stability and Corrosive Characteristics of the Solvent at High Temperatures:

A sample of methyl butyl ketone was refluxed in a closed system at atmospheric pressure for 50 hours in the presence of test-pieces of steel plate, one in the liquid and one in the vapor. No sign of decomposition could be detected; no gas was formed, the solvent changed only slightly in color, while the test-pieces showed no change in weight. The ketone therefore is stable and noncorrosive.

7. Inflammability of the Solvent:

The explosion limits of methyl n-butyl ketone are 1.2 to 8 per cent by volume in the air. The closed cup flash is 60° F. Excepting the chlorinated solvents, this flashpoint is considerably higher than the usual dewaxing solvents, making the solvent a comparatively safe one to use in a plant.

8. Toxicity of the Solvent:

A concentration of 0.1 per cent was found by the U. S. Bureau of Mines Experimental Station at Pittsburgh to be irritating to the eyes and nose of man but was found to be harmless to guinea pigs after several hours' exposure. This concentration is below the explosive limit. The presence of solvent vapor is therefore readily detectable before reaching concentrations dangerous to the health or safety of man.

9. Cost of the Solvent:

Methyl n-butyl ketone is produced by Stanco, Inc., from secondary hexyl alcohol, itself a derivative of petroleum. It sells for about 15 cents per pound. In cost, it is thus comparable with phenol which has been used successfully as a selective solvent in the petroleum industry for seven years.

Conclusions:

From the viewpoint of wax solubility, miscibility temperature with oil, filter rates and cold test-dewaxing temperature relationship, methyl n-butyl ketone behaves in an excellent manner. Its vapor pressure is such as to render recovery a comparatively simple matter without entailing large evaporation losses. It is stable and noncorrosive under distillation conditions; it is nontoxic, and, due to its characteristic smell, its presence can be noted long before the concentration reaches the lower explosive limit, making it a safe solvent. The cost of the solvent is reasonable, and in the price range of selective solvents already successfully employed by the industry This solvent should find wide application for dewaxing purposes.

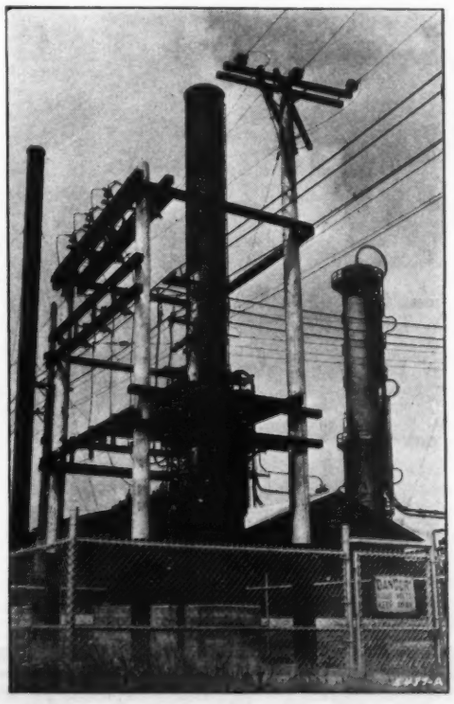
Certify Sources of Supply

Willing-to-certify sources of supply are lists prepared by the Bureau of Standards of manufacturers who have expressed their desire to supply materials on contracts based on certain selected standards and specifications, and the willingness of these manufacturers to certify to the purchaser, upon request when contracts are placed, that the material thus supplied is guaranteed to comply with the requirements and tests of the standards and specifications.

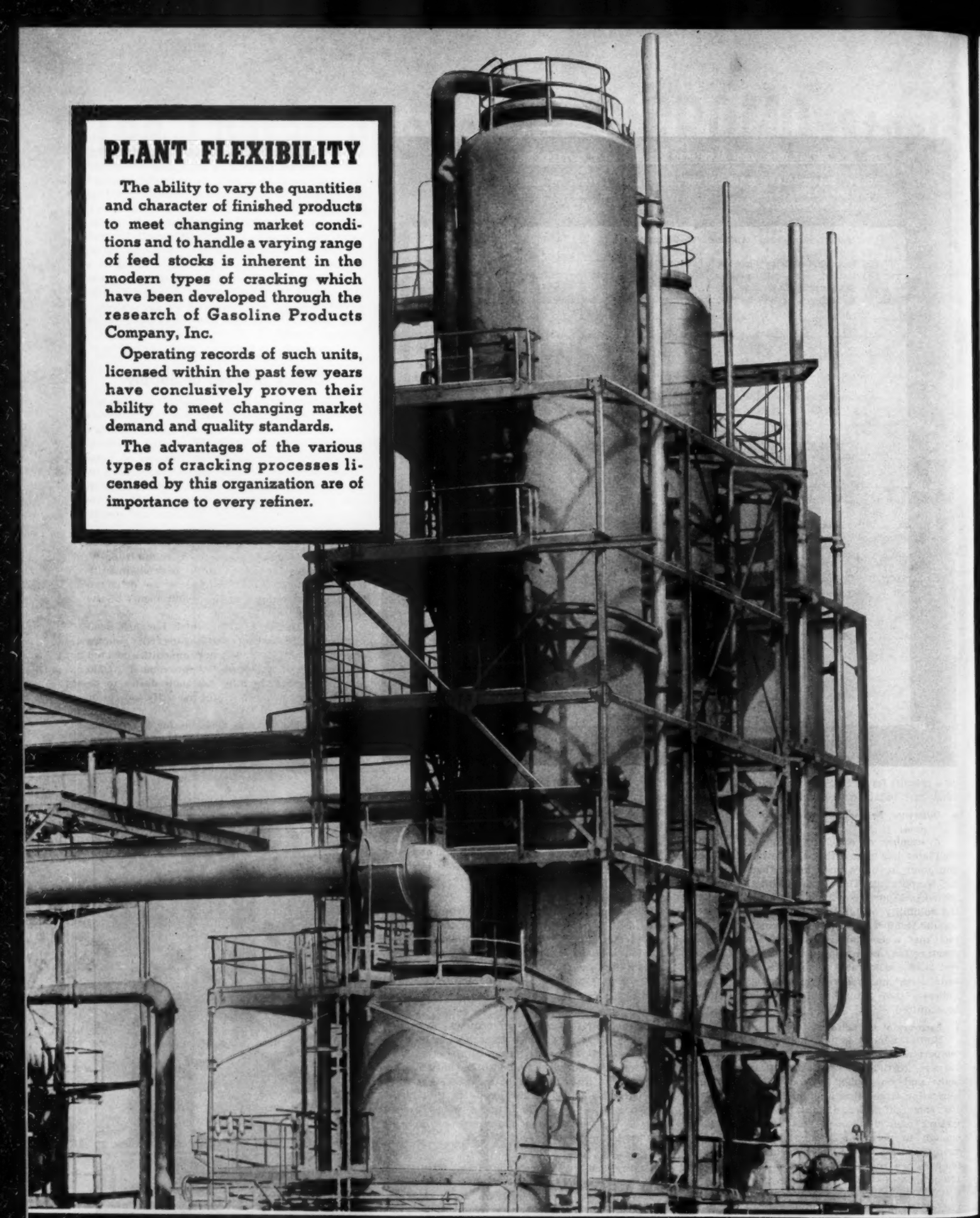
These lists are intended to facilitate the use of nationally recognized standards by minimizing the disadvantages due to the inability of small-quantity purchasers to determine whether or not delivered commodities conform to the requirements of the standards.

Letter Circular LC277a, which has just been revised, consists of lists of willing-to-certify sources of supply of a wide variety of commodities covered by commercial standards. Approximately 1,750 manufacturers have indicated their desire to be listed among the above willing-to-certify sources of supply.

The letter circular is available for distribution to all interested agencies and individuals upon request to the Division of Codes and Specifications, National Bureau of Standards, Washington, D. C.



New transformers in Skelly Oil Co. plant at Eldorado, Kans.



PLANT FLEXIBILITY

The ability to vary the quantities and character of finished products to meet changing market conditions and to handle a varying range of feed stocks is inherent in the modern types of cracking which have been developed through the research of Gasoline Products Company, Inc.

Operating records of such units, licensed within the past few years have conclusively proven their ability to meet changing market demand and quality standards.

The advantages of the various types of cracking processes licensed by this organization are of importance to every refiner.

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Special Type of Combination Cracking and Skimming Unit

By R. P. MASE

Panhandle Refining Co. recently has converted a skimming plant at Lueders, Tex., to a combination cracking and skimming unit. The cracking plant is a Dubbs unit applied to conditions encountered by small refineries that are required to produce high-octane gasoline.

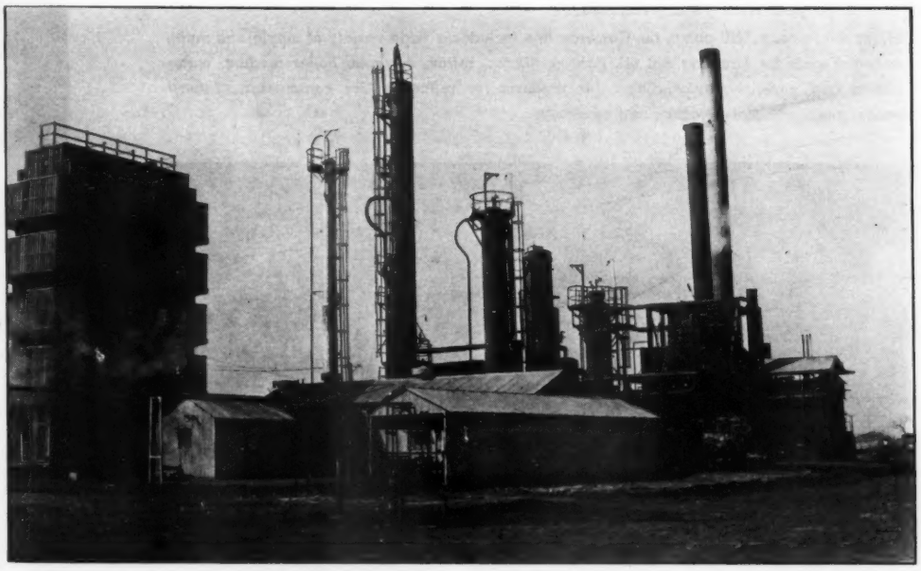
Skimming is entirely by heat exchange. The plant was designed for a crude skimming capacity of 1,000 bbls. daily with a topped crude cracking capacity of 500 bbls. daily. It was designed with the view of keeping construction and operating costs low as possible with satisfactory yields of finished products.

With this in mind, several departures from normal design were introduced. It was decided to use two-coil selective cracking in order to produce a high-octane motor fuel. Both coils are installed in one furnace of the upshot type. The combustion-chamber is split into two compartments so that separate heat control is maintained on heavy and light oil coils. Operating results indicate that this arrangement is entirely satisfactory. The unit is brought on stream with oil, but in operation is fired with gas produced by the cracking operation.

The hot-oil charge to the furnace coils is handled by one horizontal duplex power pump having a steel billet body with stainless water-cooled plungers. The plungers on the two sides are of unequal size. The larger plunger pumps oil to the heavy-oil furnace coil and the smaller to the light coil. Bypasses afford flexibility in operation. However, it is not found advisable or necessary to use these bypasses except when coming on stream. The pump is steam-engine-driven.

Both furnace coils are discharged separately to a common reaction-chamber at 275 pounds pressure. This vessel is discharged through a slide valve to a conventional flash-chamber and fractionator, each operated at about 70 pounds pressure. Residuum of 7 to 8 gravity and better than Bunker C is withdrawn from the flash-chamber. Heavy furnace feed is withdrawn from the base of the fractionator. Light furnace feed is taken from an intermediate well in the fractionator.

Condensers and coolers are of open-section or coil type and are located in the base of the cooling-tower. Absorption of gasoline from gas is by naphtha and takes place in the upper section of the same bubble-tower that is used as stabilizer. Light furnace oil is used to heat the stabilizer reboiler. Absorption and stabilization are both carried out at 70 pounds pressure. Only two pumps and no compressors are required for the vapor recovery unit.



General view of combination skimming and cracking unit built in Panhandle Refining Co.'s plant at Lueders, Tex.

Heat for the skimming operation is taken by three heat-exchangers. The first takes heat from skimming plant gasoline vapors, the second from a sidestream from the cracking plant fractionator, and the third from oil at the base of the cracking-plant fractionator. The cold crude passes through these exchangers in the order mentioned. A salt drum is installed between the first and second exchangers. Straightrun gasoline of 400° endpoint is taken overhead from the skimming-plant bubble-tower. Kerosene and gas oil are taken as sidestreams. Hot topped crude is pumped from the base of the tower direct to the cracking plant. It will be noted that all heat for the combined operation comes from one tube furnace, the fuel for which is the cracking-still gas after the same has been stripped in the absorber. One operator per shift handles the entire unit. Due to the simplified hookup, the first cost was quite moderate.

Operating Results

The crude oil is produced in the general locality of Lueders and shows the following hempel distillation:

	Per cent
Gasoline	32.1
Kerosene	12.6
Residue	53.3
Loss	2.0

The 32.1 per cent gasoline showed an engler endpoint of 427° F. while in actual operation, straightrun gasoline was cut to 400° endpoint. This accounts for the difference in yield.

Operating records for 24 days' operation with the above crude, making 392-endpoint, 71-octane cracked gasoline and 400-endpoint straightrun gasoline, show the following results:

Charge rate per day crude to skimmer, bbls.	1,060
Charge rate topped crude to cracking, bbls.	526
Straightrun gasoline, 400 e.p. (based on crude), per cent	30.7
Cracked gasoline, 392 e.p. (based on crude), per cent	26.1
Cracked gasoline, 392 e.p. (based on topped crude), per cent	52.7
Kerosene, per cent	12.2
Gas oils, per cent	4.5
Fuel oil, 7-8 gravity (based on crude), per cent	20.4
Loss skimming and cracking (based on crude), per cent	6.1

The above summarized is as follows:

Total overhead products, per cent	73.5
Cracked fuel oil, Bunker C 7-8 gravity, per cent	20.4
Loss, per cent	6.1

Typical engler distillation of cracked gasoline is as follows:

Gravity, A.P.I.	60.0
Octane number	71.0
	° F.
I.B.P.	86
5 per cent	118
10 per cent	132
20 per cent	162
30 per cent	190
40 per cent	222
50 per cent	249
60 per cent	272
70 per cent	298
80 per cent	326
90 per cent	355
Endpoint	392
Recovery, per cent	96.5
Residue, per cent	1.0
Loss, per cent	2.5

The cracked gasoline is plumbite sweetened and inhibited. Straightrun gasoline is sweetened and marketed as third grade or turned into Q Ethyl grade.

Offhand comparison of yields might be taken to indicate that the 52.5 per cent yield of cracked gasoline based on topped crude is a bit lower than normal. This is easily accounted for, however, by the low endpoint, low vapor pressure, high octane and the fact that gas oils are marketed. The unit yields high-grade products that find a ready market at a satisfactory price.

The unit was designed by the R. P. Mase Engineering Co. in collaboration with W. F. Sims of the Panhandle Refining Co., and was erected by the Panhandle Steel Products Co.

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Aircraft Fuels of High Octane Rate

By WILLIAM H. HUBNER and GUSTAV EGLOFF

Universal Oil Products Co., Research and Development Laboratories

The most skeptical now admit that the trend in aircraft design is definitely toward engines of higher power output and lower specific fuel consumption, with antiknock requirements of 100-octane number and higher.

During 1937 approximately 7,000,000 gallons of 100-octane fuel was consumed in the United States, chiefly by the Army Air Corps. Based on available data and present commitments, it is estimated that this figure will be increased to more than 20,000,000 gallons during 1938, with additional quantities of isooctane required in the production of approximately 10,000,000 gallons of 87-octane fuel containing 0.5 cc. of tetraethyl lead per gallon and 5,000,000 gallons of 95-octane fuel with 3 to 4 cc. of lead. Interesting comparisons of the quantities of the various octane grades consumed in the United States during recent years are given in Tables 1, 2, and 3.

Advantages of Fuels

The advantages of 100-octane fuel over 87-octane in engines designed to take full advantage of the higher-octane fuel, have been quite adequately reported in the literature and need only to be summarized here, namely 20 to 25 per cent increase in power output and 12 to 15 per cent reduction in specific fuel consumption. An increase in power means a substantial increase in top speed, rate of climb, and ceiling; it means also a reduction in take-off distance or the ability to take off with a greater pay load. Difficulty in lifting very large planes from the ground has placed a *definite premium* on this increased take-off power. It has been calculated[4] that a 20 per cent increase in power reduced the length of the take-off run of a large multi-engine transport by 45 per cent. This is equivalent to reducing the necessary landing area by 70 per cent in the case of rectangular and geometrically similar airports.

A decrease in specific fuel consumption means a substantial increase in flying range, with the same pay load or the ability to carry a greater pay load the same distance. In so far as actual savings in dollars and cents are concerned, several experts have calculated the value of each octane-number increase in the case of a conventional land transport plant. These expressions are summarized[5] in Table 4, using a revenue of 5 cents per passenger mile or 0.025 cents per pound mile.

An interesting study of the savings resulting from the use of 100-octane fuels was presented recently by Major Doolittle.[6] A 12 per cent saving in fuel was assumed for 100- over 87-octane fuel. Since the normal full-tank load (800 gallons) of a DC-3 or D.S.T. weighs approximately 4,800 pounds, a saving of 576 pounds of fuel (0.12 × 4,800) would result. The dollar value per pound saving in weight, over the useful life of a transport plane, has been calculated at $10 to $2,200. The figure of $10 is the penalty for overweight, whereas the $2,200 is obtained by calculating the earning power at 33⅓ cents per mile on 300 pounds at 200 m.p.h. on the basis of operating 2,000 hours per year over a five-year period. In the first case the saving over the useful life of the plane is 576 × $10, or $5,760; and in the second case, 576 × $2,200, or $1,250,000. This analysis presupposes full-load operation, which naturally would not occur in practice; but at the same time it does not take into account other advantages of the 100-octane fuel. The additional fuel cost over this five-year period, assuming a 5-cent-per-gallon premium for 100- over 87-octane and a consumption figure of 90 gallons per hour, would be $4,500 (5 × 90 × 2,000 × 5), or less than 4 per cent of the potential $1,250,000 saving.

Looking at the problem in a slightly different manner and assuming Barnard's figure of 2.2 cents saving per octane number[6, 8] as given in Table 4, the following analysis results. The actual difference between 100-octane (army method) and the 87-octane (motor method) fuel now generally used by the airlines is roughly 10 octane numbers, and 10 × 2.2 cents gives an increased gross saving of 22 cents per gallon of gasoline consumed; or, with a 5-cent premium charge, an increase in net saving of 17 cents per gallon.

Using Doolittle's figures[9] of 90 gallons per hour and 2,000 hours per year for five years, a net saving of $153,000 results (17 cents × 90 × 2,000 × 5). If the 8-cent premium now in force were used instead of the 5-cent premium suggested by Doolittle[9] as a likely figure, "when the consumption of 100-octane fuel becomes as great as the consumption of present base fuels," the net saving would be $126,000, which is still a sizable figure.

Commercial 87-octane (motor method) and 92-octane (army method) are most generally prepared by adding approximately 3 cc. of tetraethyl lead per gallon to a 74-octane straightrun gasoline. The usual procedure for preparing 100-octane (army method) aircraft fuel is to blend 50 per cent of a 74-octane straightrun gasoline with 40 per cent of commercial isooctane, 10 per cent of isopentane, and 3 cc. of tetraethyl lead per gallon.

Isooctane and to a limited extent isopentane are the only high-octane blending agents with extensive service history. However, a number of other such fuels have been suggested as being commercially useful, namely: (1) Aromatics; (2) ethers (isopropyl); (3) ketones, and (4) alcohols. Comparative octane values and physical property data of these materials are given in Table 5.

Isopentane

Isopentane is more volatile than isooctane and quite naturally supplies the front-end volatility which isooctane lacks. However, due to its relatively high vapor pressure (20.4 pounds per square inch), usually less than 10 to 15 per cent may be incorporated in the finished blend, depending upon the vapor pressures of the base gasoline and the high-octane blending agents. By simple fractionation it is reported that 190,000 gallons may be produced annually in the United States.[3] Its high heat

TABLE 2

Octane-number grade†	Per cent distribution[2] of U.S. Army Air Corps' aircraft-fuel consumption with respect to octane number for the years						
	1938*	1937	1936	1935	1934	1933	1932
100	90	29	14	2	..	..	..
‡92	3	2	1	..	..	..	..
92	4	66	82	95	96	53	..
87	..	..	..	..	..	40	86
58-65	3	3	3	3	4	7	14

*Estimated. †Army method. ‡Unleaded.

TABLE 3

Year—	Average octane rating weighted on gallonage basis[2, 3]	
	U.S. Army Air Corps†	Commercial airlines‡
1938	*98	*89
1937	95	*87
1936	93	*85
1935	91	*83
1934	90	80
1933	87	79
1932	82	73

*Estimated. †Army method. ‡A.S.T.M.-C.F.R. motor method.

TABLE 4

Expert—	Increase in gross earning power per octane-number improvement in fuel
Brass[7]	4.40 cents
Barnard[8]	2.20 cents
Keith, Carey and Ward[4]	0.25 cents

TABLE 1—CONSUMPTION OF AIRCRAFT FUEL IN THE UNITED STATES[1, 2]

Year—	Military services		Commercial airlines		Miscellaneous		Total gallons
	Gallons	Per cent	Gallons	Per cent	Gallons	Per cent	
1938	*40,000,000	41	*46,000,000	47	*11,500,000	12	*97,500,000
1937	36,420,845	41	41,424,384	46	*11,000,000	13	*87,845,229
1936	31,758,397	40	37,057,069	47	10,451,496	13	79,266,962
1935	29,319,412	40	33,260,609	45	11,104,259	15	73,684,280
1934	23,648,113	41	25,136,274	43	9,630,869	16	58,415,256
1933	21,835,526	38	26,326,796	46	8,861,104	16	57,023,426
1932	20,077,884	37	23,686,948	43	10,293,599	20	54,058,431

*Estimated.

TABLE 5

Alcohols:	Gravity, °A.P.I.	Boiling Point, °F.	Freezing Point, °F.	Vapor pressure* lb./sq. in.	Hydrogen % by wt.¶	Heating value B.t.u./lb.	Heating value %†	Octane No. — Motor method	Octane No. — Army method
Methyl	46 4	148	—144	....	12 5	9,540	46	98	...
Ethyl	47 1	173	—179	....	13 0	12,760	62	99	...
Tert-butyl	47 1	181	+26	....	....	15,520	74	100+	100+
Tert-amyl	42 7	215	—12	....	....	16,070	78	100+	100+
Aromatics:									
Benzene	29 2	176	+42	3 2	7 7	18,160	88	100+	88
Toluene	30 8	231	—139	....	8 7	12,310	89	100+	98
Xylenes‡	31 0	285	—15	....	9 4	18,500	90	100+	99
Ethyl benzene	31 0	277	—140	....	....	18,500	90	96	94
Isooctane§	72 2	211	—162	2 2	15 8	20,580	100	100	100
Isopentane	94 9	82	—255	20 4	16 7	21,100	102	90	90
Isopropyl ether	62 7	156	—125	5 3	13 7	16,900	82	98	98
Ketones:									
Acetone	46 6	135	—138	....	....	13,160	64	100	98
Methyl ethyl	43 6	175	—124	....	....	14,520	71	100	99

*Reid vapor pressure at 100° F. †Based on isooctane at 100 per cent. ‡Approximate values. §2,2,4-trimethylpentane (100-octane number). ¶See literature reference.[4]

value (21,100 B.t.u./lb.), high antiknock value (90-octane number), good tetraethyl lead susceptibility, and availability, in addition to its low boiling point, make it a valuable blending agent in the production of high-octane aircraft fuels. As such it now rates second only to isooctane.

Isooctane

Isooctane has many inherent properties to justify its use as the principal blending agent for high-octane aircraft fuels, namely: (1) Ability to stand up best under the widest variety of engine-operating conditions; (2) high heat value (20,580 B.t.u./lb.); (3) good oxidation stability without the use of inhibitors, and (4) good tetraethyl lead susceptibility. Isooctane is produced from cracked gases by polymerization and hydrogenation. The first production of commercial isooctane was practically identical with the isooctane (2,2,4-trimethylpentane) used as a standard for knock testing. Its cost was relatively high and its yield low. It utilized only the isobutylene content of the gases. With this procedure, it is estimated that the potential output in the United States would be limited to 155,000,000 gallons per year.[9, 10] However, present production methods make it possible to double or triple this amount by converting normal butylene as well as isobutylene to isooctanes and then by hydrogenation to isooctanes. The potential supply may be further increased by the conversion by dehydrogenation of the butanes contained in refinery and natural gases to form normal butylene and isobutylene and then by hydrogenation to isooctanes.

Under certain conditions, it has been found more economical to produce isooctanes of 90- to 95-octane number than those approaching 100-octane number. This is due in part to the much higher yields obtained for the lower octane products and to the good lead susceptibility of the isooctanes. For example, from a given quantity of gas containing both normal butylene and isobutylene, it is possible to produce considerably more 95 isooctane than 99 to 100 isooctane; and still more isooctane of 90-octane number. The lead susceptibilities are such that the 90 and 95 isooctanes may be increased to 100 octane, army method, by the addition of 0.9 and 0.3 cc. tetraethyl lead per U.S. gallon, respectively.

TABLE 6—PER CENT ISOOCTANE (A, B, AND C) IN STRAIGHTRUN GASOLINES

Octane No. of blend	65-octane No.			70-octane No.			74-octane No.		
	A	B	C	A	B	C	A	B	C
100	63	71	84	55	64	78	51	60	73
95	50	57	68	40	46	57	34	40	46
93	44	50	58	34	38	45	25	28	33
90	32	37	41	20	23	26	8	11	14
87	20	22	23	5	6	7	..	..	..

A = 100-octane isooctane. B = 95-octane isooctane. C = 90-octane isooctane.

This difference in antiknock rating is due entirely to the varying proportions of isomeric octanes in the mixture. For example, the isooctane used as a standard in knock testing consists exclusively of one isomer, 2,2,4-trimethylpentane, and by definition rates 100-octane number. The 90- and 95-octane isooctanes have such lower ratings because they consist of mixtures of different isooctanes (isomers), some of which have a lower and at least one a higher octane rating than 2,2,4-trimethylpentane.

It is to be noted that the lower-octane isooctanes are not less pure, chemically speaking, than the 100-octane isooctane; and that while various commercial isooctane products differ in octane rating, gravity, and boiling range, they are alike in other chemical characteristics, such as stability to light, heat, air-oxidation, etc.

A composite picture of the motor-method results obtained by blending isooctanes of 90-, 95- and 100-octane rating with straightrun gasolines of 65-, 70- and 74-octane number, plus 3 cc. of tetraethyl lead per gallon, is given in Table 6.

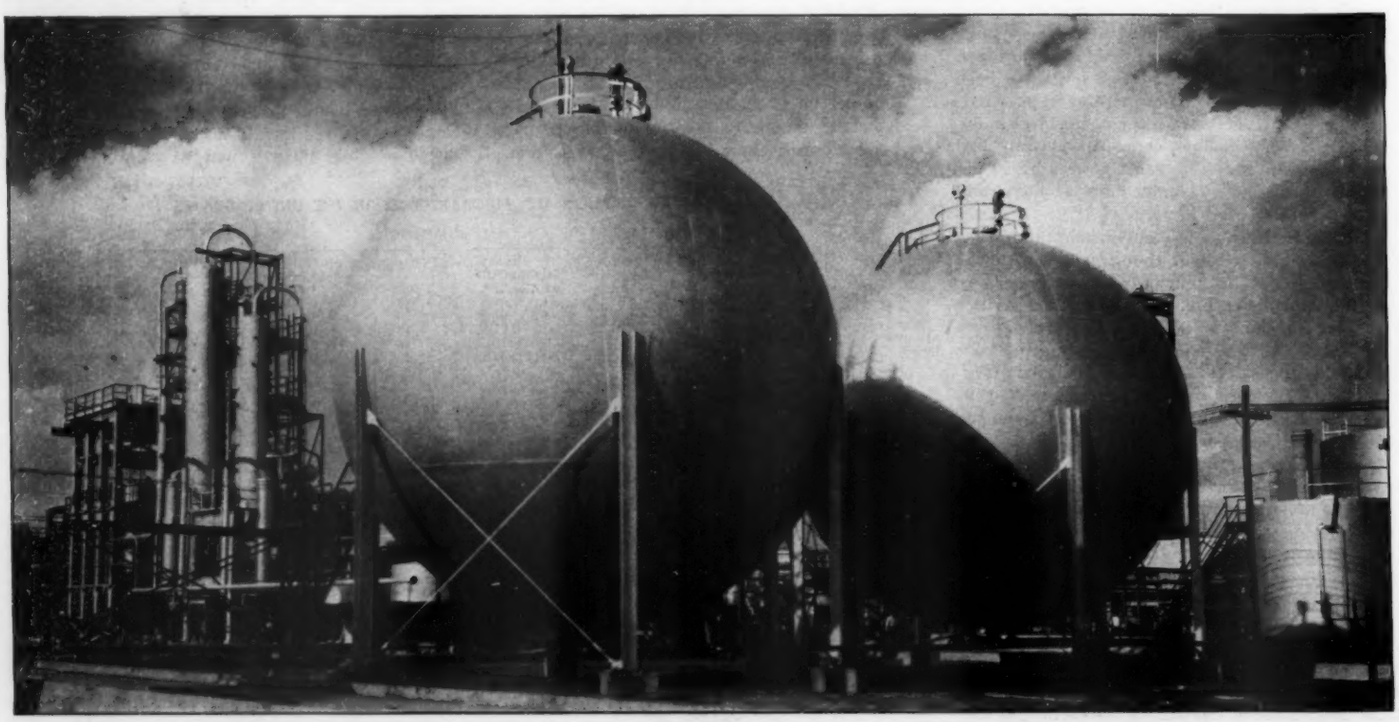
Aromatics

Aromatic hydrocarbons, particularly benzene, have been used for years to improve the antiknock quality of motor fuels. Benzene has been quite popular in Europe also as a blending agent for aircraft fuels, chiefly because of its excellent rich-mixture take-off performance.[9] It is believed,[9] however, benzene and other aromatics, such as toluene, xylenes, and ethyl benzene, suffer from such wide variation in antiknock value when used in engines of different types and under different operating conditions (particularly at lean-mixture cruising) that there is some doubt regarding their reliability in general service when compared, for example, with isooctane, which does not suffer from such disadvantages. The lower heat values (11 to 12 per cent lower than isooctane on a weight basis) and poorer tetraethyl lead susceptibilities of the aromatics also must be considered as disadvantages. In addition, the relatively high freezing point of benzene (42° F.) limits the amount that may be used in aviation blends. Toluene, xylenes, and ethyl benzene have lower freezing points than benzene and consequently offer greater possibilities as suitable blending agents for aircraft fuels; toluene appears to offer the best possibilities. From an antiknock standpoint also toluene appears to offer good possibilities as a fuel for liquid-cooled engines. This is particularly true in England, where it often is said that their liquid-cooled engines "like the aromatics."

Benzine, toluene, and xylenes are produced primarily from the high-temperature carbonization of coal and the cracking of gas oil to produce illuminating gas. They may be produced also from refinery and natural gases by cracking, in which case it is reported that over 1,200,000,000 gallons of 100-octane fuel containing 80 to 85 per cent of aromatics may be produced annually.[11]

Isopropyl Ether

Isopropyl ether, more correctly named diisopropyl ether, has both advantages and disadvantages when used as a blending agent in aircraft fuels. Against its high octane rating by both the army and motor methods (98 octane), its high tetraethyl lead susceptibility, and its freedom from carburetor-icing tendencies must be balanced such disadvantages as its relatively low heat value (18



Hortonspheres in the foreground with part of new polymerization unit in the left background

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per cent lower than isooctane on a weight basis) and its miscibility with water.

Isopropyl ether is produced by chemical treatment of propylene, which is present in cracked gases. It is estimated that there is sufficient propylene available from cracked gases in the United States to produce approximately 340,000,000 gallons of technical isopropyl ether per year, which when blended 40 per cent with a 74-octane straightrun gasoline and 3 cc. of tetraethyl lead per gallon will produce 850,000,000 gallons of 100-octane fuel.[2] This volume could be greatly increased if mixed ethers, such as methyl, ethyl, and isobutyl, were produced or if all the available propane in natural and refinery gases were converted to propylene and then to isopropyl ether.

Data on the use of isopropyl ether in full-scale engines, either on the dynamometer or in flight, are quite limited. Laboratory testing, however, in small single-cylinder engines indicates that it has the required antiknock characteristics for a safe aircraft fuel.[3] In the case of a national emergency it may be used to advantage in military planes, particularly for pursuit and attack service, where fuel consumption is relatively unimportant. However, for commercial flying purposes, where fuel economy is more important, it appears to have little value unless, as some authorities believe, its cost should prove to be materially lower than isooctane; then it may well find commercial use either as a special take-off fuel or in relatively short flights where fuel load does not materially influence pay load.

Catalytic polymerization unit under construction in Anglo-Iranian's Abadan refinery

Ketones

Certain ketones, notably acetone and methyl-ethyl ketone, have been found to have high antiknock value and good tetraethyl lead susceptibility. However, like isopropyl ether and the alcohols, ketones contain oxygen, which results in low heating value (29 to 36 per cent lower than isooctane on a weight basis) and high specific fuel consumption.

Acetone may be prepared in one of several ways: (1) By special fermentation of corn or molasses; (2) catalytically from ethyl alcohol; or (3) from propylene present in cracked gases. Methyl-ethyl ketone may be prepared by catalytic dehydrogenation of butanol-2, which in turn may be obtained from the butylenes present in cracked gases.

Alcohols

Alcohols, chiefly ethyl and methyl, have been used for many years for blending with gasoline as motor fuel, particularly in Europe. Compared with gasoline, the advantages of the alcohols are high octane rating (in many cases 98 to 100+ octane number) and high latent heat of vaporization. Some of the disadvantages are low heat value (22 to 54 per cent lower than isooctane on a weight basis), separation in the presence of water, and corrosive and solvent troubles.

When considered as a blending agent for high-octane aircraft fuels, several additional advantages and disadvantages must be considered. One disadvantage is the preigniting tendencies in air-cooled engines; another is the poor tetraethyl lead susceptibility of most of the alcohols. In addition, they appear to be quite critical to engine operating conditions. As a distinct advantage, however, alcohols are noted for their de-icing qualities.

At present ethyl alcohol is prepared from cracked gases by synthesis and by fermentation of agricultural products. Of the 110,000,000 gallons of ethyl alcohol produced in the United States during 1937, about 10 per cent was derived from cracked gases. In commercial practice, tertiary alcohols are manufactured generally by absorbing cracked gases which contain isobutylene and other isoolefins. Sulfuric acid of 76 per cent concentration is used as the absorbing agent. Dilution with water hydrolyzes the mixture and the final step is steam distillation.

Blending Values and Lead Susceptibilities of High-Octane Fuels

An indication of the comparative blending values and tetraethyl-lead susceptibilities of the various high-octane fuels discussed in this paper is given in Table 7.

Antiknock Compounds

Tetraethyl lead in the form of 1-T Ethyl fluid is the only antiknock compound in general service use for aircraft fuels. It is the most effective knock-suppressor known today. Its use has been limited by three factors: (1) Hot and cold corrosion, which increase appreciably with high concentrations; (2) the tendency toward the deposition of lead on the spark-plug electrodes; and (3) the fact that its effectiveness decreases as the concentration is increased. However, due to recent metallurgical advances and the general use of stellited valves and valve-seat inserts, corrosion is no longer the serious problem that it was (and still is) in the older-type engines. To use the words of Major Doolittle[5]: "It can safely be said that the economic advantages incident to the use of lead are far greater than the disadvantages. Recent tests, not yet considered conclusive by all, indicate that lead in concentrations up to 4 cc. per gallon is not detrimental to the engine and has a decided stabilizing effect on the fuel, increasing the effective knock rating in the full-scale engine. If this should definitely prove to be the case, we should break away from the 2.5 cc. and 3 cc. fuels at once, because the 4 cc. fuels will not only be better, but cheaper." It will be interesting to follow the reactions of the military services to this conclusion. The cold-corrosion problem should be more acute with them than with the commercial airlines. In the latter service, the planes are on the ground for as little time as possible, whereas in the military services idle periods are more numerous; consequently the engines are more susceptible to cold corrosion.

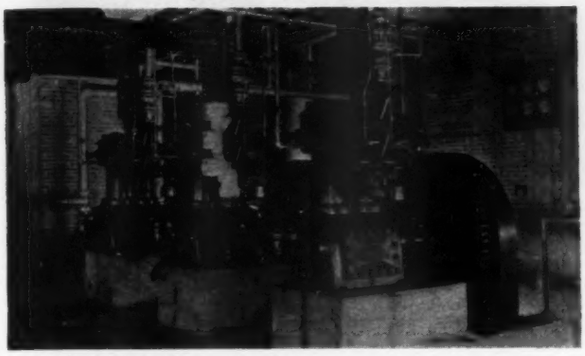
Aniline is generally known to be a good knock-suppressor, although far less effective than tetraethyl lead. Only a few per cent may be mixed with gasoline because of its relatively poor solubility. Recently it has come into limited use as "Anilol," a patented mixture marketed by the Fuel Development Corp. As its name implies, it consists of a mixture of aniline and alcohol (butyl and either

TABLE 7

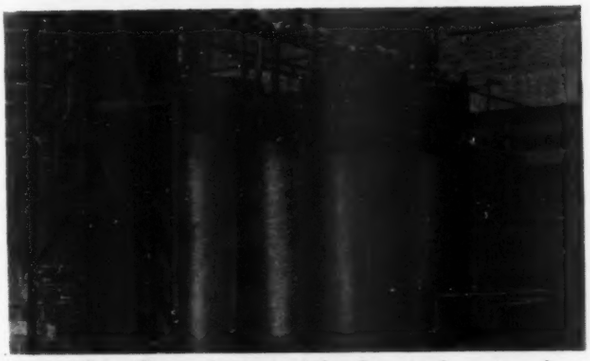
Octane number—	Iso-pentane	Isooctanes		Aromatics				Iso-propyl ether	Ketones		Alcohols		
C.F.R. Motor Method:		100 oct.	95 oct.	Ben-zene	Tol-uene	Xy-lenes	Ethyl benzene		Ace-tone	Methyl-ethyl	Ethyl	Methyl	Tert-butyl
1 Straight	90	100	95	100+	100+	100+	96	98	100	99	99	98	
2 50% blended with 70 octane straightrun	80	84	82	81	82	84	85	86	85	86	88	*89	83
+ 1 cc. TEL/gal.	87	90	89	85	87	88	89	93	93	93	89	*91	91
+ 2 cc. TEL/gal.	91	94	92	88	90	90	92	96	96	95	89	*93	95
+ 3 cc. TEL/gal.	94	97	95	90	92	92	93	99	98	96	89	*95	97
+ 4 cc. TEL/gal.	95	99	97	91	93	93	94	100	99	97	89	*96	99
Army Method:													
1 Straight	90	100	95	88	98	99	94	98	100	99			
2 50% blended with 70 octane straightrun	81	85	83	80	82	85	85	88	87	86	86	*85	85
+ 1 cc. TEL/gal.	90	93	91	85	89	91	90	94	95	94	87	*87	93
+ 2 cc. TEL/gal.	93	96	95	88	92	94	92	98	98	96	87	*88	97
+ 3 cc. TEL/gal.	96	99	97	89	94	96	94	100	100+	98	87	*89	99
+ 4 cc. TEL/gal.	98	100+	98	90	95	97	95	100+	100+	99	87	*89	100

*Blend contains 50 per cent 70-octane straightrun gasoline, 40 per cent methyl alcohol and 10 per cent ethyl alcohol.

Ammonia absorption refrigerating machine generators



Vertical duplex motor-driven ammonia compressors



Vertical Spira-Flo condensers and absorbers, in absorption plant

Absorption machines with double-pipe rectifiers and exchangers

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ethyl or methyl). Partly because of its poor solubility in gasoline, it is ordinarily introduced into the fuel system through a metering injection device, in which case it is used both as a de-icing fluid and as an antiknock for take-off or during emergency operation of a multiengine aircraft when one engine is inoperative. Its present cost is about $3 per gallon. Its effectiveness when compared with aniline and ethyl alcohol is shown in Table 8.

TABLE 8

	Octane number—C.F.R. Motor Method		
	Non-leaded	+1 cc. TEL/gal.	+3 cc. TEL/gal.
Straightrun gasoline*	70	79	84
With 2% Anilol	76	83	86
With 2% aniline	78	85	88
With 2% alcohol (ethyl)	71	80	85
Blend isooctane and straightrun gasoline*	87	95	100+
With 2% Anilol	90	97	100+
With 2% aniline	91	98	100+
With 2% alcohol (ethyl)	88	96	100+

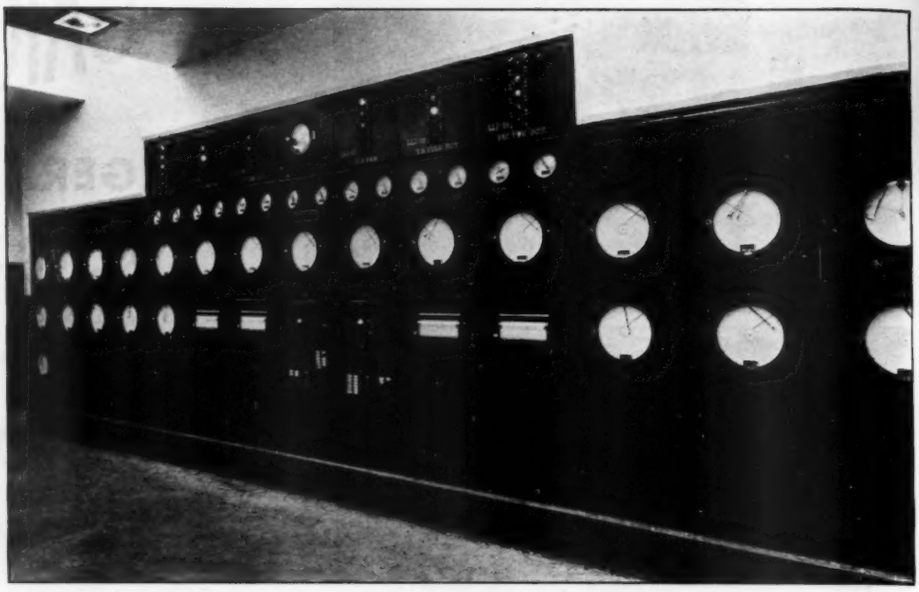
*70 octane number.

Water has been successfully used as a take-off antiknock, usually by injecting it into the intake manifold of the engine during take-off. Studies[5] have been made on the possibility of water recovery from the exhaust as a means of avoiding the necessity of carrying a considerable water load. Water suffers from the obvious danger of freezing and in most service use will require the addition of an antifreeze agent. Since alcohol is the indicated antifreeze agent, the mixture of water and alcohol would have possibilities as both a take-off fuel and a de-icing fluid. It has been reported[5] also that small additions of water will inhibit preignition, which is one of the serious obstacles to the use of alcohol as a blending agent in high-octane fuels.

The profound effect of water on modifying the combustion reaction is difficult to explain. It may be due to the heat absorbed by the water as it vaporizes. Or perhaps a water-gas reaction is set up by the action of steam on the hydrocarbons, in which case carbon monoxide and hydrogen would be formed, and carbon monoxide is known to be an excellent knock-suppressor.

Test Methods for Determining Octane Numbers

In addition to the 87- and 100-octane grades of aircraft fuel, there are 12 more grades specified for use in the United States and 11 in foreign countries, the range being 58 to 100 octane number. Three test methods are in use for determining these octane numbers, namely: (1) Army Air Corps, (2) A.S.T.M.-C.F.R. motor, and (3) modified motor. The essential operating conditions of each are given in Table 9.



Typical control panel in a Gulf Coast refinery

Methods of Test

In the United States the standard A.S.T.M.-C.F.R. motor method is specified by all engine manufacturers and commercial airlines, and the Navy Bureau of Aeronautics in all except its 100-octane grade; the army method is used for all specifications of the Army Air Corps and in the navy's 100-octane grade. The modified motor method is used by the British Air Ministry, British engine manufacturers, and Imperial Airways (England). The 100-octane fuel of the air ministry and British engine manufacturers is one exception, in which case the standard A.S.T.M.-C.F.R. motor method is specified. According to available data, the military services, engine manufacturers, and commercial airlines of other foreign countries also specify the standard motor method.

Few data are available in the literature by which the three methods may be compared accurately. It is generally believed, however, that cracked fuels, polymerized unsaturated hydrocarbons, aromatics, and similarly sensitive fuels are rated lower by the army method than by either the standard or the modified motor method. In fact, the army method is adjusted so as to rate benzene 88-octane number, whereas it rates over 100 octane by the standard motor and modified motor methods. On the other hand, leaded fuels consisting essentially of straightrun gasoline or blends of isooctane and straightrun are rated somewhat higher by the army method; apparently tetraethyl lead is more effective as a knock-suppressor under the operating conditions (high speed and jacket temperature) used in the army method. Ratings by the modified motor method are slightly higher than by the standard motor method for the sensitive-type fuels, with straightrun, isooctane, and other less sensitive fuels showing practically no change.

Comparative data obtained recently with various types of high-octane fuels by the above three methods of test, are shown in Table 10. As indicated in each case the high-octane fuel was blend-

(Continued on Page 112)

TABLE 9

	A.S.T.M.-C.F.R. Motor Method	Modified Motor Method	U. S. Army Air Corps Method
1 Engine speed, r.p.m.	900	900	1200
2 Intake temperature, °F.	300	260	app. 100
3 Cooling-jacket temperature, °F.	212	212	330
4 Method for measuring knock intensity	Bouncing-pin and knockmeter	Bouncing-pin and knockmeter	Temperature-plug and potentiometer

Early stages of construction of hydrogenation plant of Anglo-Iranian Oil Co. at its Abadan refinery in Iran

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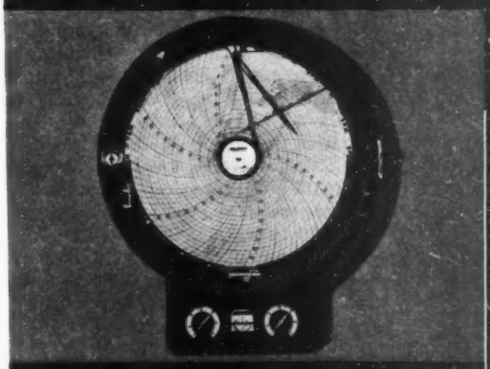

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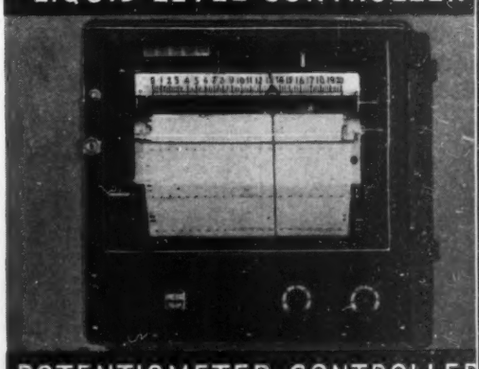

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ed 50 per cent with a 70-octane straightrun gasoline; each blend was tested straight and with the addition of 3 cc. of tetraethyl lead per U. S. gallon (3 cc. TEL/gal.).

It is unfortunate that three methods exist for testing aircraft fuels. However, the extensive full-scale and laboratory engine tests on fuels in the 87 to 100+ octane bracket, which are now being carried out in the United States by the aviation fuels division of the C.F.R. committee and by interested parties in Europe, should soon result in a universal standard method for rating such fuels.

When this standardization has been accomplished it is hoped that the various agencies (military services, engine manufacturers, commercial airlines, and oil companies) writing specifications will cooperate to reduce the number of grades. Even with two test methods in use in the United States, is there sufficient justification for the existence of 14 different grades of aircraft fuel, namely, 58, 65, 71, 72, 73, 74, 80, 83, 87, 90, 92, 93, 95 and 100 octane number? Major Doolittle[9] has suggested four grades, namely:

73 octane, unleaded	Army, navy, commercial
80 octane, with 1 cc. TEL/gal.	Commercial
90 octane, with 4 cc. TEL/gal.	Navy and commercial
100 octane, with 4 cc. TEL/gal.	Army, navy, commercial

While studying the problem of standardization it is desired also that interested groups give consideration toward uniformity in volatility requirements. At present, considering only the various specifications for the 87-octane grade (see Table 11), the 50 per cent distillation point is found to vary from 195° to 221° F. and the 90 per cent point from 231° to 347° F. Furthermore, some groups specify the per cent recovered or condensed, whereas others specify the per cent evaporated.

It is believed that the year 1938 will show a marked drop in the number of volatility and octane-rating specifications of motor fuels used in aircraft.

The authors wish to express their sincere appreciation to the representatives of the military services, commercial airlines, Bureau of Air Commerce, and other aircraft-fuel technologists who contributed data for this paper.

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TABLE 10

50 per cent blended with 70-octane straightrun:	Test method: Army, TEL/gal. 0 cc.	Army, TEL/gal. 3 cc.	Standard Motor, TEL/gal. 0 cc.	Standard Motor, TEL/gal. 3 cc.	Modified Motor, TEL/gal. 0 cc.	Modified Motor, TEL/gal. 3 cc.
Isopentane	81	96	80	94	80	93
Isooctane (100 octane)	85	99	84	97	84	96
Isopropyl ether	88	100	86	99	86	99
Benzene	80	89	81	90	82	90
Toluene	82	94	82	92	83	92
Acetone	87	100+	85	98	85	98
Alcohol (ethyl)	86	87	88	89	89	91
70-octane straightrun*	71	87	70	85	70	85

*Base gasoline used in above 50 per cent blends.

TABLE 11—87-OCTANE GRADE (MOTOR METHOD)

	Vapor pressure max. *(b)*	Distillation characteristics °F. Maximum 5%	10%	50%	90%	96%	10+50% °F. min.	% Rec. min.	% Loss max.	% Res. max.
American Airlines	7.0	*150	*167	*212	*266	*311	*307	96	2	2
Eastern Airlines	7.0	...	167	212	275	...	307	...	2	1
Northwest Airlines	7.0	150	158	200	255	275	*(a)*	96	...	2
Pratt & Whitney	7.5	*150	*158	*195	*231	*252	...	96	2	...
Transcontinental	7.0	...	167	221	347	...	*(a)*	...	2	2
United Airlines	7.5	150	158	195	231	252	...	96	2	...
U. S. Navy	7.0	...	167	212	275	...	307	...	...	2
Wright	7.0	...	167	212	275	...	307	...	2	1
U. S. Army *(c)*	7.0	...	167	212	275	...	307	...	...	2
Pan American	6.5	...	167	212	275	...	307	...	...	2

*Temperature at which respective percentages of distillate are recovered (or condensed); all other temperatures refer to per cent *evaporated*.
(a) Sum of 10, 50 and 90 per cent points shall not be less than 564° F.
(b) Reid vapor pressure, lb./sq.in. at 100° F.
(c) 92-octane army method; for certain fuels this is equivalent to 87-octane motor method.

Kinks and Gadgets Efficient Aids in an Oil Refinery

In every refinery there will be found certain kinks and gadgets which have been developed by the operators to improve efficiency or to eliminate possible hazards. A few items of this type which may have general application are presented.

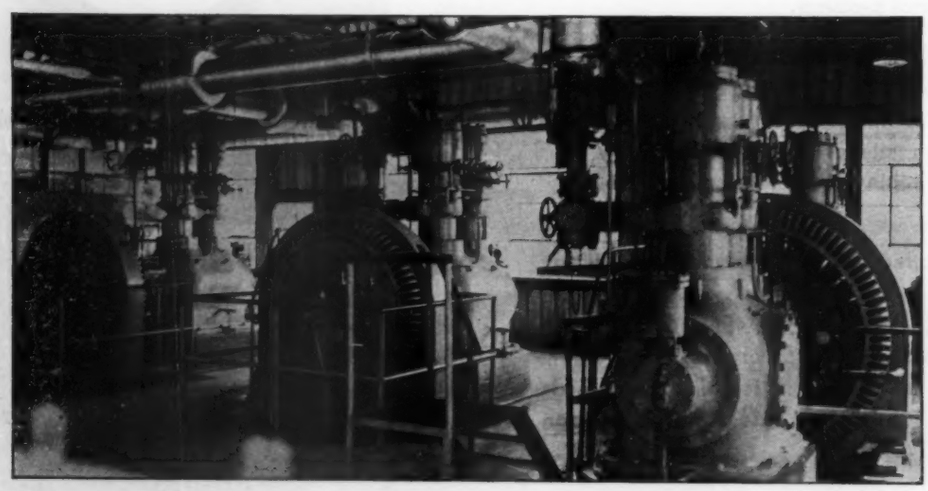
With the conventional system for lubricating piston rods on air compressors, it is difficult to lubricate that portion of the rod which passes inside the packing. To assure positive lubrication, an employe designed a small bucket wheel turbine to drive the Hills McCanna force feed lubricator. The turbine wheel is about 8 inches in diameter and contains 16 three-fourths inch cups around the periphery. This turbine is driven by exhaust steam from the power end of the air compressor, but compressed air can be substituted for exhaust steam with equally satisfactory results. The arm of the lubricator is directly connected with a small brass rod to the turbine rotor. This idea has proven very satisfactory in practice and has been adopted as standard equipment on all air compressors in the refinery.

The use of a colored strip of concrete to cover electrical conduits or ducts placed in concrete floors, was suggested by an employe. This will eliminate the possibility of cutting into such conduits when making repairs or alterations to the concrete floor. On one occasion a trench was being cut in a concrete floor with an air-operated tool and the chisel punched into a conduit carrying a 2,300-volt electric cable. Fortunately, the only damage done was the shutting down of a small portion of the equipment.

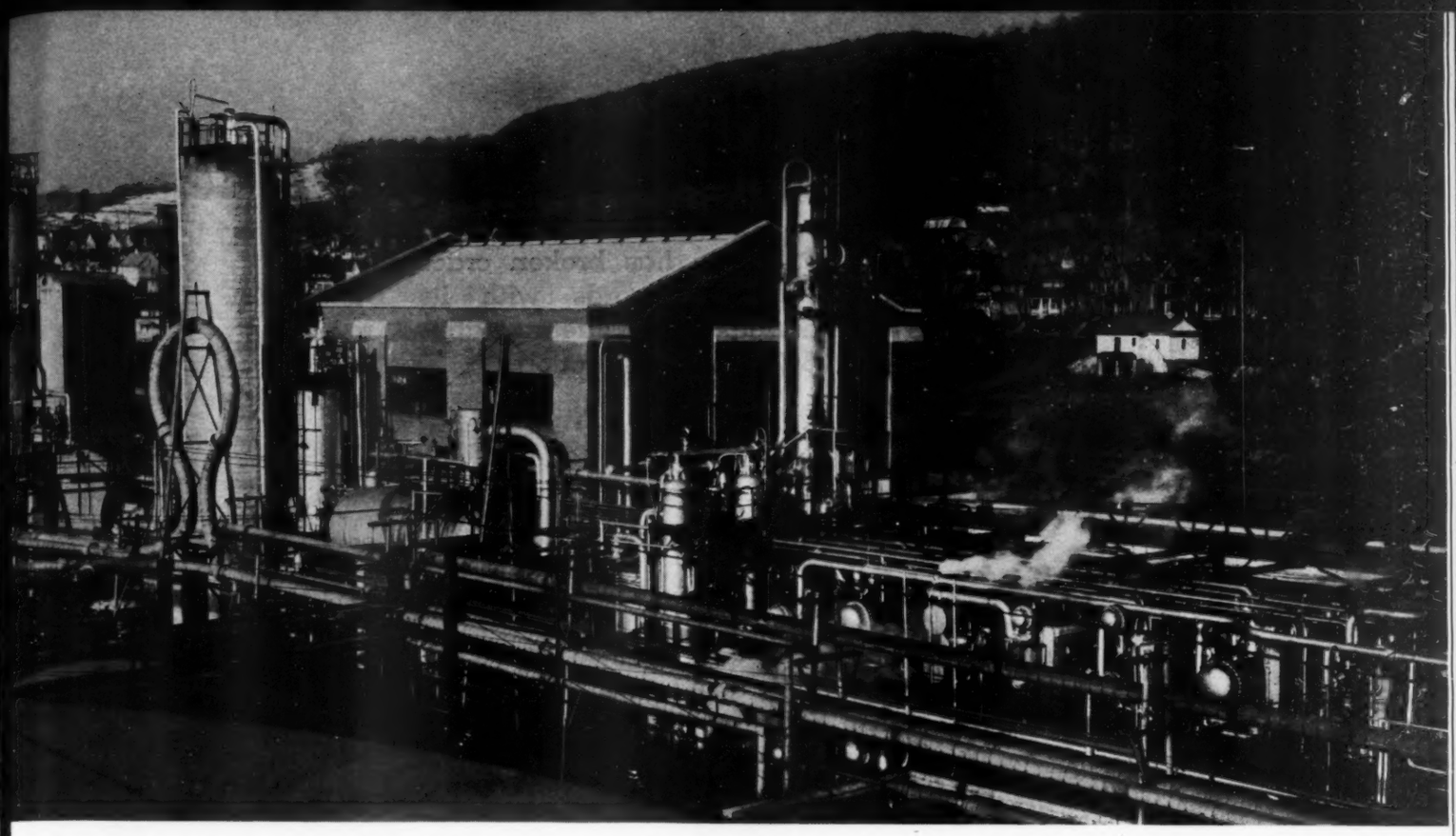
When cleaning or making repairs to stills and other process equipment, the usual practice was to erect temporary timber booms to facilitate handling of material. The use of a small steel boom made from 2½-inch extra heavy pipe was suggested as a substitute for the wooden booms. These booms are about 7 feet high with a 2-foot overhang and are fitted with a small pulley wheel. These booms were made to fit in a socket made of 3-inch standard pipe which was permanently fastened in a convenient place near the platform or manholes through which the material was to be handled. Since the steel booms are light in weight and can be readily moved from place to place, it requires only a relatively small number to accommodate a number of locations.

The formation of alkali scale around handhole plates presents a problem when cleaning a boiler, and it is often necessary to hand cut such deposits, which is time consuming and frequently results in injury to the handhole plates. A boiler repairman suggested that a three-fourths inch pipe containing a number of small holes be installed between the tube sheet and the doors and used as a spray. Just prior to bringing the boiler off the line, warm water is sprayed against the hot alkali scale which cracks and dissolves readily.

Considerable difficulty was experienced from darkening of the numbers on meters and pressure gauges due to exposure to corrosive gases in the refinery. An instrument repairman suggested that white zinc base paint be used to repaint register heads on meters and pressure gauges, and thermometer scales, to eliminate this condition. An alternative solution, the use of lamp black and a clear lacquer paint was suggested by another employe, and both methods are now in use.



Synchronous motors driving vertical ammonia compressors at the treating plant of Wilshire Oil Co.'s Norwalk refinery. An unusually high power factor (.99) is the result of using synchronous motors in this service. The refinery's connected electrical load is 1600 k.w., and the demand averages 800 k.w.



General view of propane dewaxing and deresining plant of Kendall Refining Co., Bradford, Pa. The main building in center houses the compressors and some pumps on the ground floor and the continuous pressure filters on the second floor. At the left of the building are the vertical filter feed tank and warm solution tank, and to the right the recovery stills and exchangers

Refining of Pennsylvania Oils by Propane Process

By W. B. McCLUER*, J. T. DICKINSON† and H. O. FORREST†

About three years ago the Kendall Refining Co. initiated a program for studying methods of improving the refining of Pennsylvania lubricating oils, with particular emphasis on decreasing the cost of finished oils. Several factors, aside from the cost of raw material, are involved in determining the cost of finished oil, and it was considered essential that all of these should be aided by the process selected. On this basis it was necessary that the process attain the following objectives:

(1) A decrease in the cost of dewaxing.
(2) An improvement in the yields on dewaxing.
(3) A decrease in the cost of decolorizing.
(4) An increase in the capacity of the decolorizing plant.

It was decided early in the investigation that little or no direct saving could be made in dewaxing of neutrals with any process except by virtue of combination with the cylinder-stock dewaxing plant. Major emphasis was therefore placed on refining the cylinder stock. A complete study was made of all processes available for attaining the four stated objectives, and the process selected as most sitisfactory was dewaxing and deresining in propane solution. A plant was installed to carry out this process, and it is the purpose of this article to present the results which have been obtained in this plant.

The general aspects of the application of propane to the treatment of lubricating oils has been discussed quite thoroughly in several papers, especially that of Wilson, Keith and Haylett[1], which was presented at the World Petroleum Congress in 1936. Only a minor portion of such discussions has dealt with Pennsylvania oils, and although the installed propane dewaxing capacity is now 18,000 bbls. per day, this plant is the first to use propane for the dewaxing of Pennsylvania oils. Similarly the installed propane deasphalting or deresining capacity now is nearly 10,000 bbls. per day, but the actual commercial results obtainable by deresining Pennsylvania residuum with propane are presented here for the first time.

The term "deresining" is used for that range of deasphalting where the material removed is a very high-viscosity product, but is not asphaltic in character. Normal deasphalting at temperatures of 100° to 120° F. will remove asphaltic bodies, and if the propane solution of deasphalted oil is then heated to a higher temperature, for example 150° F., a further precipitation occurs which has been called deresining. Since Pennsylvania residum normally contains no asphalt, the propane precipitation process employed is termed deresining.

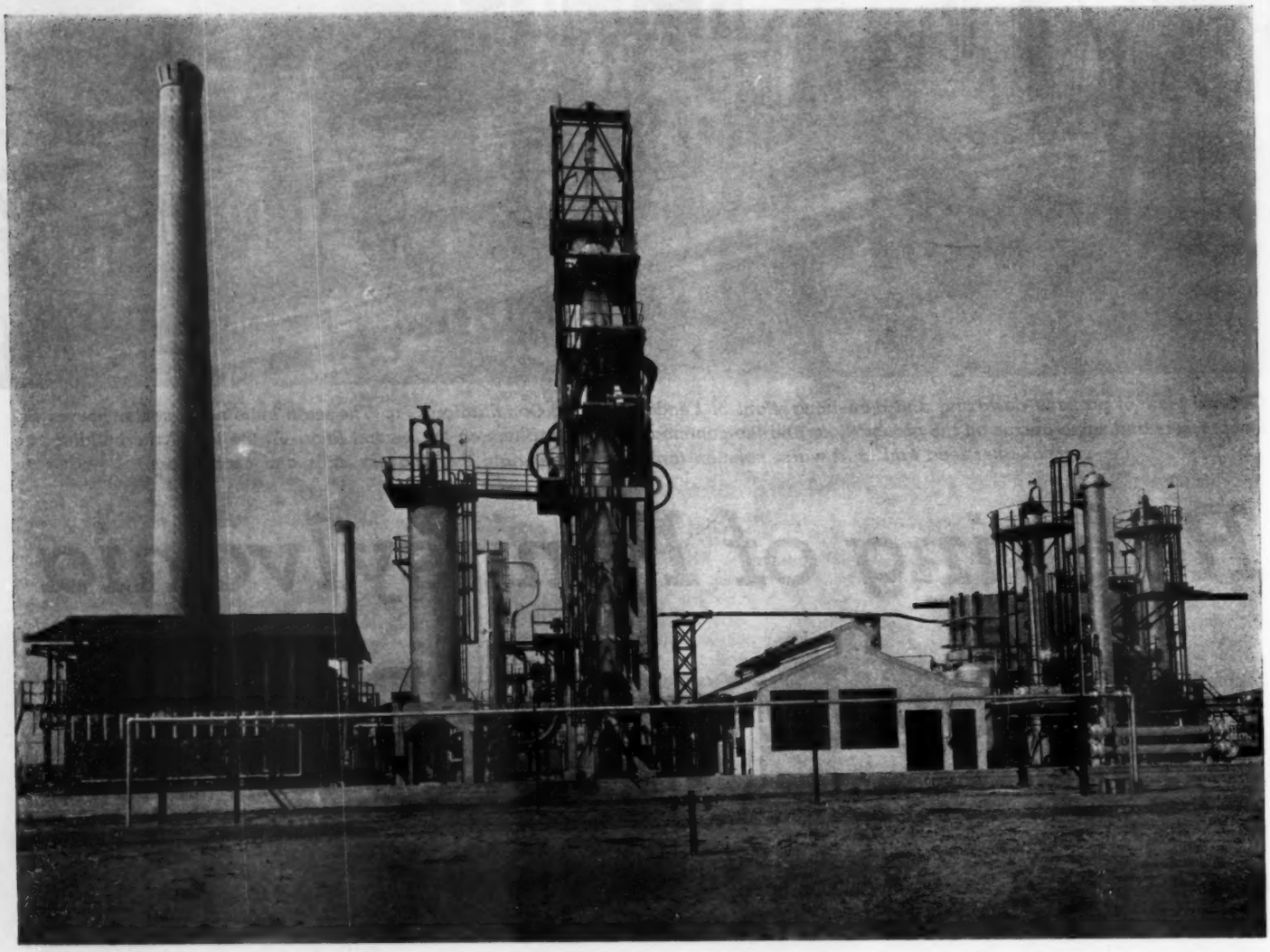
At the time this program was started, data were available on Pennsylvania cylinder stock which indicated that high yields could be obtained by dewaxing in propane solution and that a large portion of the color bodies could be removed by propane deresining. Laboratory work was therefore undertaken on the Bradford crude fractions from the refinery to substantiate the previous data and to determine whether such processing would permit attainment of the objectives of the Kendall Refining Co. This work included dewaxing and deresining the cylinder stock and dewaxing the reduced neutral.

The dewaxing tests on the cylinder stock were made by putting the oil in solution in three volumes of propane, heating to about 130° F., chilling by self-refrigeration to —40° F. and filtering in a small pressure filter. No difficulty was encountered in producing zero pour-test oils by this method and the wax cake, after washing with one volume of propane, had an oil content of 15 to 20 per cent. The laboratory yield of dewaxed oil averaged 86.0 per cent when making a pour test of 0° F. The wax removed was dark in color, and the color and

*The Kendall Refining Co., Bradford, Pa.
†The M. W. Kellogg Co., New York.

On-Stream Record

A. N. C. A. P. has broken cracking unit records with its Dubbs plant—118 days continuously on stream, above rated capacity, charging 35% crude oil bottoms



Administracion Nacional de Combustibles, Alcohol y Portland. Dubbs plant at their refinery at La Teja, Uruguay

● The ANCAP refinery—designed, fabricated and built by Foster Wheeler—includes this single-furnace Dubbs unit arranged for the application of a second furnace and auxiliary equipment now being installed, to convert it into a selective cracking plant. This equipment will permit even longer runs and increase the present exceptional yield of high octane gasoline.

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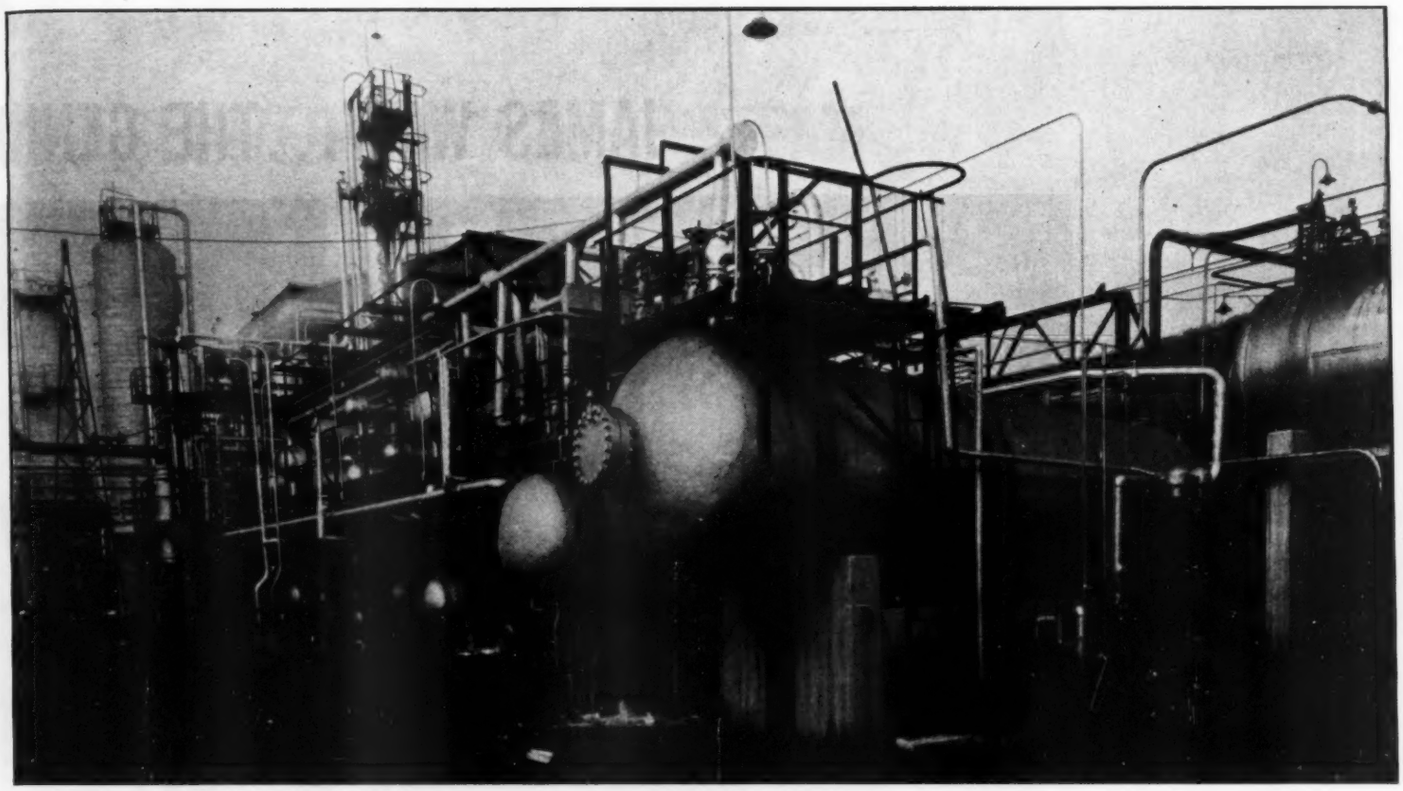


Resin settler in foreground and behind it the resin washer and various exchangers. The vessel at the extreme right is one of the two horizontal propane storage tanks

carbon residue of the dewaxed oil were improved by dewaxing, indicating that the effective yield for comparison with other processes would be even higher than 86 per cent.

Additional tests were made on this stock using a small continuous pressure filter, and these pilot-plant operations indicated that the stock could be successfully processed on continuous filters of the type used in the Wood River plant of the Shell Petroleum Corp.

Similar small-scale pressure filter tests on the reduced neutral showed that this oil could also be dewaxed satisfactorily in propane solution, with an average yield of slightly over 81 per cent of zero pour-test oil. A propane ratio of 2 to 1 appeared to be sufficient at a filtering temperature of —40° F. A typical laboratory experiment on the reduced neutral is presented in Table 1, with a similar test on cylinder stock for comparison. Although the filter rate on the neutral was quite high, the amount of oil recovered from the wax by washing was extremely high.

Examination of the wax cake showed that it was of the fluffy voluminous type normally associated with light distillate waxes when crystalized from all solvents, and the large quantity of oil recovered by washing indicated that the high yield might be difficult to obtain in commercial operation. Pilot-plant tests were then made on the small continuous filter, which indicate that it might be difficult to apply sufficient wash effectively because of the soft nature of the wax cake.

Experiments were therefore made with a number of dewaxing aids, and it was found that several materials could be used, but that petrolatum from propane dewaxing of the residuum was entirely satisfactory. Three per cent of residual wax changed the character of the cake to the dense type which could be effectively washed and which insured high yields. Production of commercial wax would require distillation before sweating, but the cost of such an operation is low, and is insignificant when compared with even a slight increase in yield. Assuming that only half of the oil in the unwashed cake could be recovered commercially by washing, the yield was estimated as about 77 per cent with no dewaxing aid, and as 82 per cent when using a material equivalent to petrolatum for this purpose.

TABLE 1—LABORATORY DEWAXING DATA

	Cylinder stock	Reduced neutral
Propane ratio (Vol.)	3.0	2.0
Filtering temperature, °F.	—40	—40
*Filter rate gal./sq. ft./hr.	3.7	7.6
Chilling rate °F./min.	1.1	1.6
Wash ratio (Vol.)	1.0	1.0
Oil recovered by washing—%	2.0	13.8
Dewaxed oil yield (Vol. %)	86.4	82.0

Inspections	Charge	De-waxed oil	Charge	De-waxed oil
Gravity ° A.P.I.	25.7	24.9	31.9	30.2
Vis S.S.U. at 210° F.	146	154	43.7	45.3
S.S.U .at 100° F.		2585		184
Carbon residue %	2.38	2.21	.025	.024
†Color—Tag. Rob.	6-¼ D.D.	1-⅛ D.	6-¾	6
Pour ° F.	35	0	90	0

*Based on dewaxed oil. †DD—double dilute. D—dilute.

TABLE 2—EFFECT OF PROPANE DERESINING ON FILTER YIELDS BRADFORD CYLINDER STOCKS

	Filter yields in barrels per ton			
Color of percolated oil	5 NPA	6 NPA	7 NPA	8 NPA
Original cylinder stock	6.7	8.3	10.4	13.1
Deresined—7 vols. propane				
3.5% removed	9.8	12.4	17.6	29.8
6.5% removed	11.0	15.5	23.3	48+
Deresined—10 vols. propane				
7.0% removed	18.1	27.8	47.8	....
13.0% removed	40+	....	....	....

TABLE 3—SUMMARY OF 14-DAY TEST RUN PROPANE DEWAXING AND DERESINING OF BRADFORD CYLINDER STOCK. KENDALL REFINING CO., BRADFORD, PA.

Quantities	Average B.P.D.	Per cent of charge
Charge	1102	100
Deresined oil	895	81.2
Petrolatum	159	14.4
Resins	53	4.8
Gain	5	0.4
Dewaxed oil (deresined oil plus resins)	948	86.0
Utilities		
Steam lbs./per hour	20,838	
Electricity—K.W.	412	
Water G. P. M.	308	

Inspections	Charge	Deresined oil
Vis. at 210° F.	163	150.5
Color O.D.	4162	824
Flash C.O.C.	555	550
Pour	35	0

As a result of this laboratory program and a study of the investment and operating cost of propane dewaxing plants, it was concluded that propane dewaxing would permit attaining the first two of the main objectives. Attention was then turned to deresining to determine its value in reaching the two additional objectives.

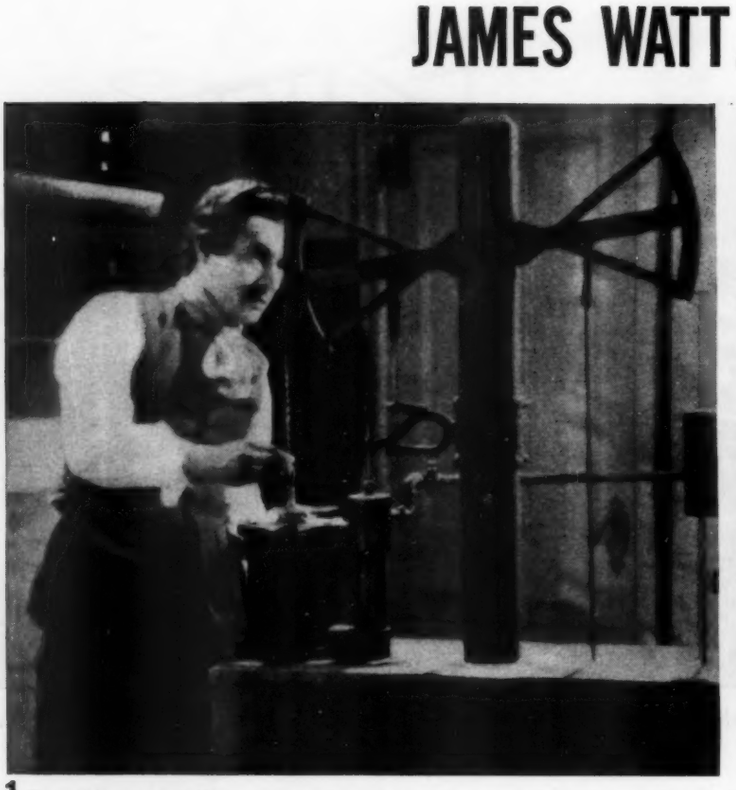
A series of deresining runs was made on the residuum to determine the most satisfactory propane ratio, temperature, and method of processing. The criterion used for the effectiveness of deresining was the improvement in filter yield when percolated in naphtha solution. Several methods of operation were used, and the data presented in Figure 1 represent one such method. Seven volumes of propane were used for the initial precipitation of heavy resins at a temperature of 145° F., and the fresh propane was used to wash these resins. The temperature was then increased to 170° F. and a second resin cut was made, which was then washed with an additional three volumes of propane. By this two-stage method it was possible to remove 3.3 per cent of 16.3° A.P.I. resins and 7.9 per cent of 910 S.S.U. at 210° F. viscosity stock while leaving a light blending stock of 118 S.S.U. at 210° F. viscosity having a color of 1 T.R. and a carbon residue of 1.48.

A second method of operation is shown in Figure 2 and in this case only one stage of settling was used, with the same total quantity of propane (10 volumes) as in the previous experiment. The temperature was raised to 149° F. to precipitate more resins, and the yield obtained was 92.9 per cent of deresined oil having a viscosity of 122 S.S.U. at 210° F. and a color of 3-¾ T.R. dilute.

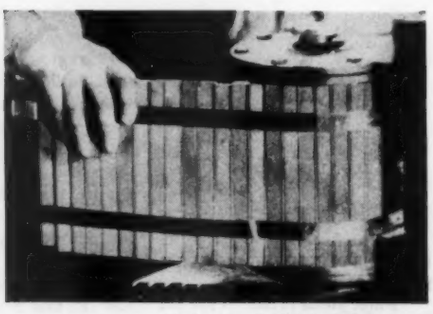
Several additional runs were made on this same residuum, and a series of percolation filter tests was carried out to determine the proper basis for design of the plant. The curves in Figure 3 show the effect of propane ratio and of the

(Continued on Page 118)

JAMES WATT...THE GENIUS W



1 From this crude model, an exact replica of Watt's original steam engine, came the greatest industrial and social revolution the world has ever seen. Actually, the principle of the steam engine had been discovered 30 years before, but the original model was so imperfect it could do no useful work. Watt improved its efficiency . . . invented the valve action that doubled its power . . . found out how to convert its reciprocating motion into rotary motion . . . and devised the governor to keep its power under control. The industrial age was under way . . .



2 Constantly searching for further improvements in his engine, Watt soon saw that heat escaping through the cylinder walls was wasting fuel and power. So he applied a band of wooden strips around the cylinder . . . one of the first known uses of industrial insulation. Crude as this type of insulation was, it was immediately effective. The same amount of fuel gave more power . . . the efficiency of the engine was greatly increased . . .

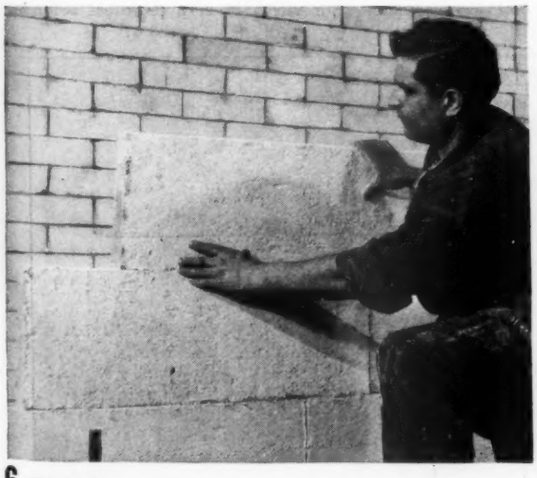
3 Asbestos, in the time of Watt, was known only as a curiosity . . . a "magic mineral," dense as rock, that could be fluffed out into silky fibers and woven into cloth that was unharmed by the hottest fire. At right is shown a thin vein of asbestos in the rock in which it was formed ages ago. Today, due largely to pioneering research by Johns-Manville, asbestos is made into many types of insulating materials for a wide variety of purposes.

4 A far cry from Watt's crude wooden strips is this scientifically designed insulation for the boiler of a giant locomotive that gets more power from a pound of fuel than Watt ever dreamed of. The insulating material is Johns-Manville 85% Magnesia, for many years the standard insula-

5 Watt knew his wood strips reduced heat losses, but he did not know why. We have since learned the real reason . . . the efficiency of a material in retarding heat flow depends primarily on the number of small cells per unit of thickness. About 1900, a remarkable new insulating material was discovered in California . . . a vast deposit of the skeletons of tiny sea organisms, called diatoms. More than *40 million* of these minute shells are contained in each cubic inch of diatomaceous earth. Processed by Johns-Manville, this material, known as Celite, is made into some of the most efficient high-temperature insulations known today.

WHO STARTED THE AGE OF STEAM

tion in the moderate temperature (600° F.) field. 85% Magnesia is made from dolomite limestone, chemically converted into magnesium carbonate and combined with asbestos fiber into blocks and pipe insulation. Steam lines, boilers, oil-refinery fractionating apparatus and many other types of industrial equipment are effectively protected against heat waste with this J-M Insulation.



6 This boiler furnace wall is being insulated with Superex Block—a highly efficient insulation made of diatomaceous earth (Celite), bonded with asbestos fiber. Superex, also manufactured in pipe-covering form, is recognized as the outstanding insulation for superheated steam lines and for conserving fuel and improving performance in high-temperature industrial furnaces of all types. Other Celite insulations include Sil-O-Cel Brick and Sil-O-Cel C-3 Semi-Refractory Insulating Concrete.

Industry as we know it today began in 1765, the year James Watt developed the first practical steam engine. With this unlimited source of mechanical power at his command, man finally escaped from monotonous, backbreaking methods of doing the world's work. Human energy was directed to more constructive tasks, and during the next century civilization made more progress than in all the ages since the dawn of history.

Watt's engine ran by heat, and it wasted far more than it used. Seeking to improve it, he hit on the idea of wrapping a jacket of wooden strips around the cylinder. This is one of the first known uses of industrial insulation . . . the beginning of the idea of conserving heat and fuel.

For more than a century, however, insulation was not considered important. Fuel was plentiful . . . heat losses from boilers, furnaces and exposed pipes were taken for granted. But as the use of heat in industry broadened into new fields and as industrial processes improved, operating efficiencies and production costs were more closely watched. The vital need for effective insulation was recognized.

Today, wherever heat or refrigeration is employed in industry, insulations are also used. And economical, efficient insulating materials are now available for use throughout the entire range of temperatures used in industry—from far below zero to 3000° F. and more above.

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Johns-Manville

INSULATIONS FOR EVERY TEMPERATURE

...FOR EVERY SERVICE CONDITION

7 For the other end of the temperature scale, where heat must be kept out of refrigerated space or piping, J-M Rock Cork Sheets and Pipe Covering are used. Made of mineral fibers with a waterproof binder, these materials offer the advantage of a mineral insulation that is rot- and vermin-proof, and which retains its high insulating efficiency indefinitely. For every insulation requirement, there is a type and form of J-M Insulation designed to do the job efficiently and economically.

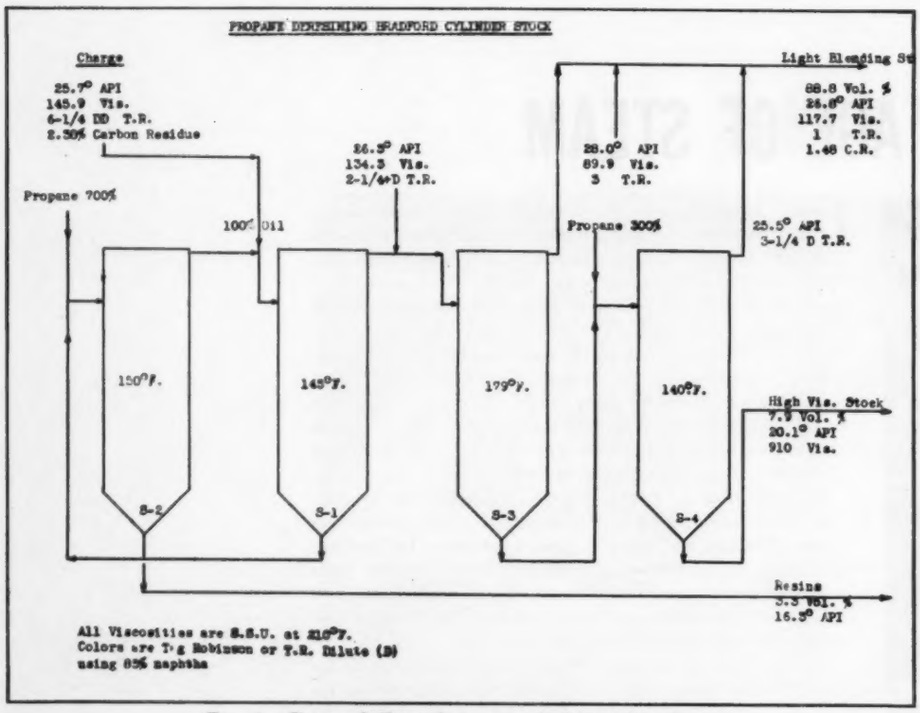


Fig. 1—General flow diagram of deresining unit

amount of resins removed on the filter yield when producing a percolated stock of 7 N.P.A. color. A more complete summary showing the effect of resin removal when percolating to different colors is presented in Table 2. From these data it is apparent that a propane ratio of 10 to 1 is advantageous, and that with this ratio the removal of approximately 3 per cent of resins should improve the filter yield by 100 per cent.

The results of these tests show that the percolation cost may be decreased by 50 per cent and the capacity of the percolation plant increased by 100 per cent, thus attaining the last two objectives. In addition, they show the marked flexibility of the deresining plant in producing various grades of oil by removal of different quantities of resins. The combination of propane dewaxing and propane deresining provides extreme flexibility in lubricating-oil refining, because such a plant is capable of performing dual functions, each of which can be varied to meet market demands with simple operation changes.

Commercial Plant Design

As a result of this laboratory work the commercial plant was installed at Bradford. The design capacity is 1,045 bbls. per day when dewaxing and deresining cylinder stock, and 1,100 bbls. per day when dewaxing neutrals.

The general operation of this plant has already been described by Bown[3], and many of its important features are quite similar to those of the Shell Petroleum Corp.'s plant at Wood River, Ill.[4], so that only a brief outline is presented here. Referring to the flow diagram, Figure 4, the cylinder stock is continuously blended with three volumes of propane at a temperature of 180° F., cooled to 70° F., and charged to the warm solution tank. From here it flows alternately to one of two horizontal chillers, where propane is evaporated by reducing the pressure and vaporized propane is compressed by a variable displacement compressor, the suction pressure of which corresponds to the vapor pressure of propane at the temperature in the chiller. During chilling, cold propane is added to replace that evaporated and to control the propane ratio. This cold propane is chilled by exchange with the dewaxed solution in ordinary shell and tube units, and the refrigeration recovery is sufficient to heat the dewaxed solution to about 70° F. When the solution has been chilled to 40° F., it is then transferred to the filter-feed tank, and from there is pumped continuously to the two pressure filters. The warm-solution tank and the filter-feed tank act as surge tanks before and after the batch chillers, and the operation of the plant is therefore continuous insofar as feed rates, filtering and recovery are concerned.

The continuous filters are of the same type as described previously[3], except that the length has been increased to 14 feet and the area to approximately 350 sq. ft. per filter. The dewaxed solution, after exchange with refrigerating and wash propane, is blended with 1 to 5 volumes of warm propane and heated to the deresining temperature, which may be from 140° to 180° F., depending on the amount of resins to be removed. Two additional volumes of propane are used for washing the resins, and the overhead stream from this settler is normally recycled to the primary heavy-oil settler. The deresined oil then flows through preheaters to the still, and about 95 per cent of the propane is removed at condenser pressure. Depropanizing is completed by flashing to atmospheric pressure and stripping with steam. Petrolatum and resin solutions are depropanized in the same manner, except that atmospheric flashing and steam stripping are carried out in the same section of the still.

Operating Results

The plant has been operated primarily for the production of zero pour bright stock with the removal of a small amount of resins, but has also produced plus 20 pour bright stock with small resin removal and zero pour bright stock with large resin removal. In addition it has produced minus 5 pour neutral and has operated successfully on dewaxing intermediate or slop cuts to produce zero pourpoint oils. On every stock which it has been called upon to process, the plant has given complete satisfaction, and the ease of changing from one stock or method of processing to another and the range of these stocks and processing methods give an idea of the flexibility of a propane plant.

Cylinder Stock

The plant met all of its guarantees for residual operation on a 14-day test run during the period from October 30 to November 12, 1937. Guarantees were based on the method of processing, which included dewaxing to zero pour test and deresining to eliminate a small quantity of resins. The essential results of the test run are summarized in Table 3.

The data obtained in this test run, representing 14 consecutive days of operation, are adequate proof of the ability of a propane plant to produce consistently high yields of zero pour-test bright

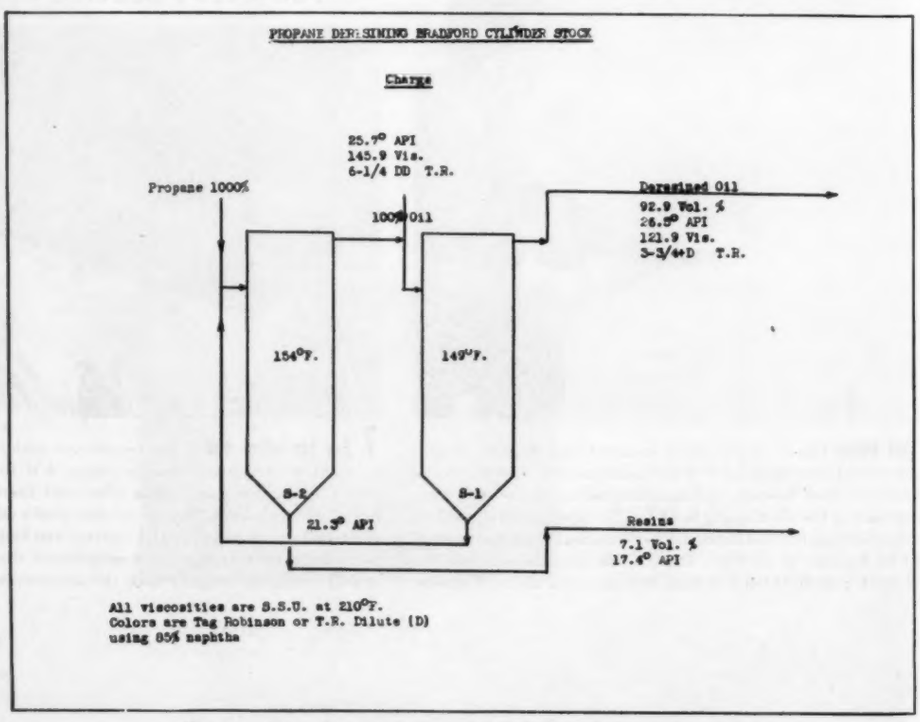
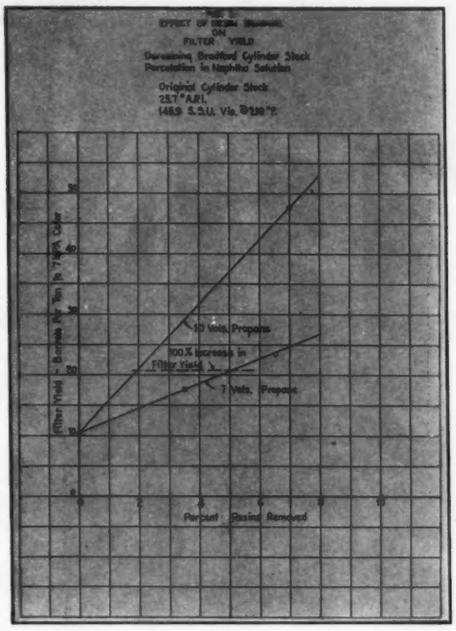


Fig. 2—Operating conditions in deresining equipment

stock from Pennsylvania residuum. The effect of deresining is shown by the decrease in color of approximately 80 per cent with the removal of 4.8 per cent of resins. Both the dewaxing and deresining results are entirely in accord with the laboratory data on which the design of the plant was based.

A more detailed analysis of the operation of the plant when producing zero pour-test bright stock is shown in Table 4. The information presented here was obtained by taking spot samples throughout the system and calculating the quantities of the various intermediate streams from gravity balances. Where comparable data are available from the test run they agree quite closely with those from the spot test. The additional inspections of products, not taken for the entire test run, show the distribution of materials within the system and are helpful in interpreting the effects of propane processing.

The effect of propane treatment on carbon residue and color is very apparent from these data. On dewaxing alone, the carbon residue dropped from 2.33 to 2.19 (in contrast to the usual increase with other dewaxing solvents) and the color as determined from optical density measurements dropped from 3,250 to 2,093. This color improvement is accounted for by the concentration of color in the wax, which has an O.D. color of 11,970. Since the wax itself has a low O.D. color, this high value for the petrolatum indicates that it includes some very heavy resins. If proper credit were given to the propane process for the removal of this material in the actual dewaxing loss, for comparison with other methods of dewaxing, would be still less than the 13.9 per cent shown by these data. Even without this correction, the yield of 86.1 per cent of zero pour dewaxed oil having an O.D. color of 2,093, a carbon residue of 2.19 and a viscosity of 165 S.S.U. at 210° F. is outstanding for the processing of Bradford residuum.



Color improvement on dewaxing is only incidental and deresining was installed primarily to improve color and carbon residue. By this deresining operation the O.D. color of the oil was decreased to 750 and the carbon residue to 1.73, while the pour remained 0° F. and the viscosity was 148 S.S.U. at 210° F. The large concentration of color bodies in the resin fraction is shown by its color of 28,960 O.D. and its carbon residue of 12.5 per cent.

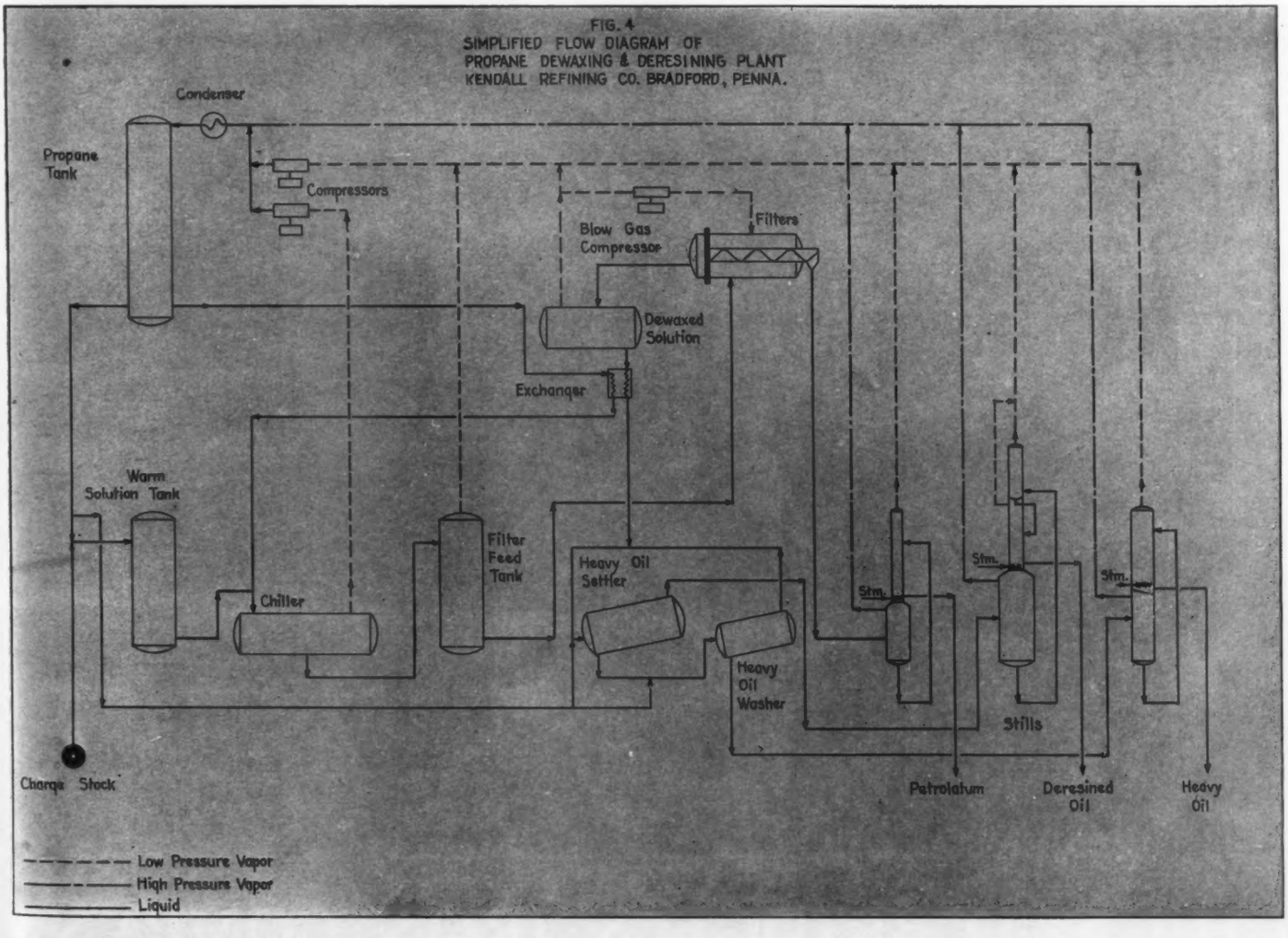
In addition to zero pour operation, the plant has also operated to produce 20 pourpoint bright stock, and the longest consecutive period of such operation was six days in November, 1937. The production figures for this period show an average charge rate of 1,186 B.P.D. and product yields of 86.6 per cent dewaxed and deresined oil, 3.7 per cent resins and 8.9 per cent petrolatum. The average yield of dewaxed oil prior to deresining was 90.3 per cent based on charge, or 89.9 per cent based on products. It can be stated conservatively that 90 per cent of 20° F. pour-test bright stock is produced by propane dewaxing Bradford residuum, and this indicates an increase in yield of 1 per cent above 86 per cent for each 5° F. rise in pourpoint above 0° F.

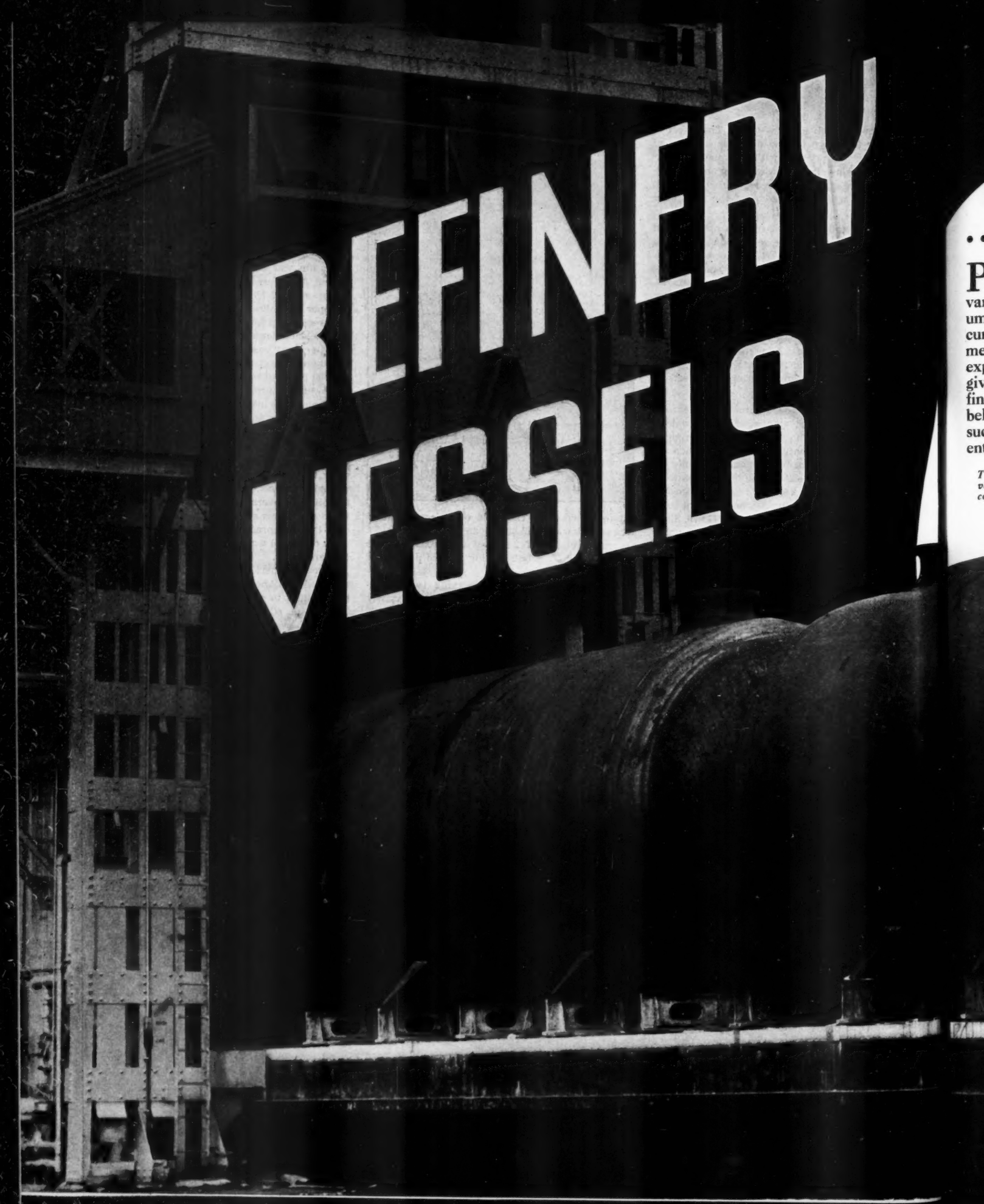
The resin-settler was held at a slightly lower temperature when producing the 20° F. bright stock in order to maintain the same finished oil viscosity and compensate for the wax retained in the oil. The average results from the plant under these conditions show a reduction of 1 to 1.5 per cent in resin precipitation, and the difference in color of the oil was apparent in filter-house operation and costs.

For short periods the deresining plant has also operated at higher temperatures on zero pour-test bright stock to produce approximately 13 per cent

(Continued on Page 122)

FIG. 4
SIMPLIFIED FLOW DIAGRAM OF
PROPANE DEWAXING & DERESINING PLANT
KENDALL REFINING CO. BRADFORD, PENNA.





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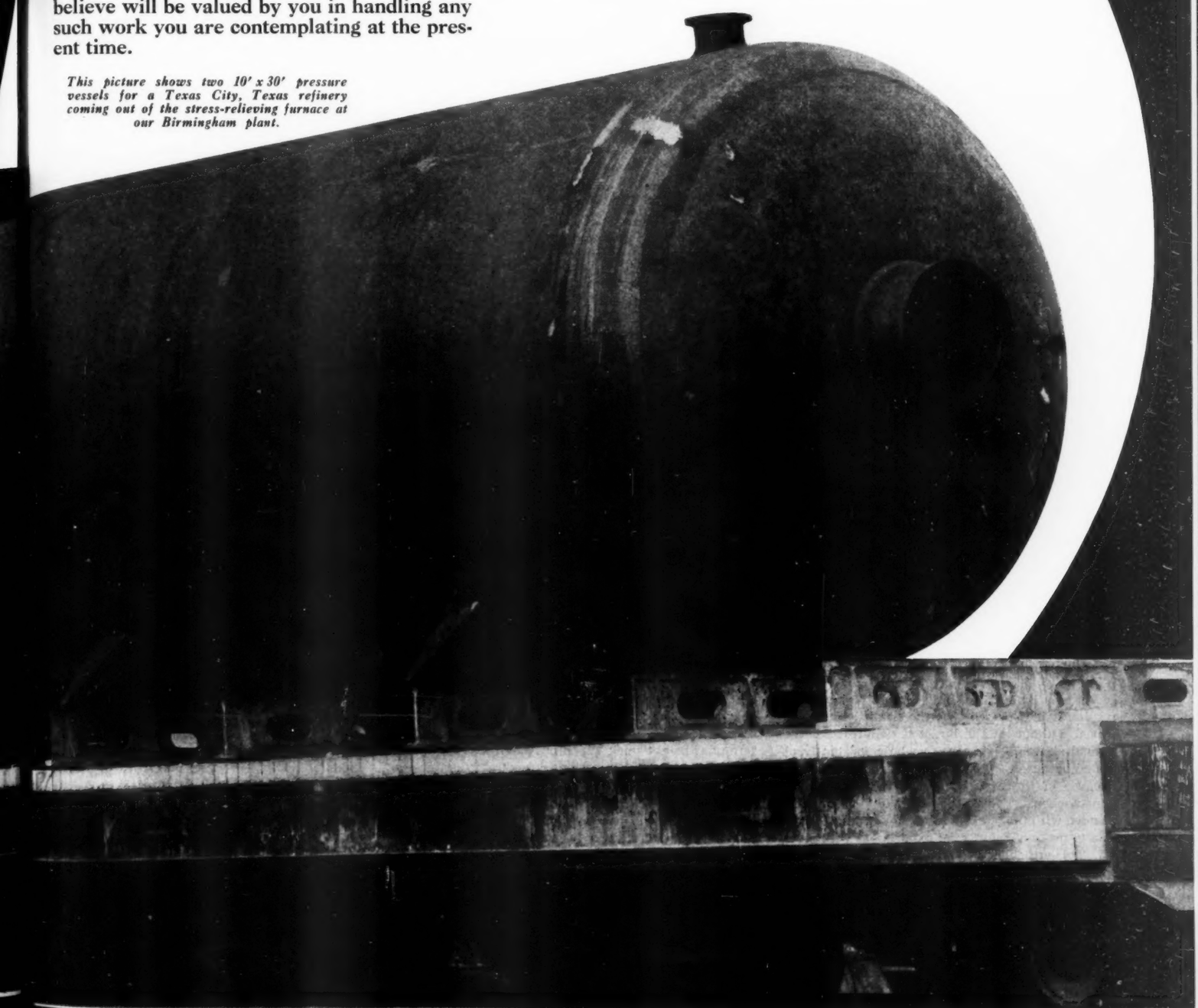

DALLAS	1441 Liberty Bank Bldg.	CHICAGO	2128 Old Colony Building	PHILADELPHIA	1615-1700 Walnut St. Bldg.
HOUSTON	2919 Main Street	DETROIT	1514 Lafayette Building	BOSTON	1517 Consolidated Gas Building
TULSA	1606 Hunt Building	CLEVELAND	2204 Rockefeller Building	SAN FRANCISCO	1054 Rialto Building
BIRMINGHAM	1536 North Fiftieth Street	NEW YORK	3347-165 Broadway Building	LOS ANGELES	1423 Wm. Fox Building

of resins or heavy oil. Although only one stage of deresining is used in the commercial plant, the results of the operation are quite similar to those shown in Figure 1 for two-stage operation in the laboratory, with the obvious exception that no separation can be made between the two heavy-oil streams. The dewaxing operation is the same as when producing from 3 to 5 per cent resins, but the color and carbon residue are considerably improved by the higher deresining temperature. Typical inspections of the deresined oil and resins obtained when precipitating 13 per cent of resins are shown in Table 5.

The laboratory work on deresining had indicated that the removal of 3 per cent of resins would decrease the percolation requirements by about 50 per cent. Prior to the installation of the propane plant the clay requirement was about 90 tons per day for 350 bbls. of bright stock. With this plant operating to remove from 3 to 4 per cent of resins the capacity of the percolation filters has been greatly increased, so that at present the plant decolorizes 680 bbls. per day with 80 tons of clay, or only 46 per cent of what would have been required on the old basis. This reduction in the quantity of clay handled and burned per barrel of finished oil has resulted in a material reduction in decolorizing costs. No definite data are available as to clay requirements when removing 13 per cent of resins, but a mere straining operation is required and the cost is extremely low.

These results show that the plant has attained its objectives in decreasing the percolation cost and in increasing the filter-house capacity. They also show that the objective of materially increasing the yield of dewaxed oil has been reached, insofar as operation on residual stock is concerned. Although the particular advantages of deresining are applicable only to the residual stock and not to the distillate, the advantage of high yields is equally applicable to both.

Neutrals

Because of stock limitations it has not been possible to make long runs on the reduced neutral, and the longest run to date was one of seven days. This served as a test run for this stock and the essential data are summarized in Table 6.

During the entire period of this test run the pourpoint of the dewaxed oil was consistently —5° F. or lower. Even with this subzero pour, the average yield based on charge was 81.6 per cent, and based on total products it was 82.7 per cent. It seems quite conservative to state that the yield of —5° F. pour neutral which can be made by the propane process, using a dewaxing aid, is at least 82 per cent. Additional data from operations since the test run was made indicate that the yield of zero pourpoint neutral is approximately 84 per cent.

As pointed out in the discussion of laboratory results, it is expected that the neutral can be dewaxed without an aid, but it is doubtful whether a yield above 77 per cent can be consistently obtained because of the fluffy character of the wax. Because of the highly satisfactory operation obtained when 2.5 to 3.5 per cent of petrolatum is blended with the neutral, it has not appeared advisable to make a commercial experiment without an aid. This anticipated loss of 7 per cent in yield by operating without the petrolatum additions would correspond to a reduction in revenue of $300 per day, and there appears to be no reason why this loss should be suffered, since the present operation is so simple.

All of the neutral wax has been accumulated and recently equipment has become available for distillation of the neutral wax from the petrolatum. The separation is a simple one, and only a small amount of fractionation is required to obtain all of the neutral wax, with no contamination from the petrolatum. The slack wax so produced is being sweated commercialy to produce about 57 per cent of 124-126° F. A.M.P. wax. Although only the 124-126° F. A.M.P. wax is being marketed at present, the slack wax has been sweated commercially to produce higher melting-point waxes, for example 49 per cent of 132° to 134° F. A.M.P.

TABLE 4—QUANTITIES AND STREAM INSPECTIONS DEWAXING AND DERESINGING BRADFORD CYLINDER STOCK

	Charge	Dewaxed oil	Petrolatum	Primary resins	Washed resins	Deresined oil
Quantity B.P.D.	1310	1128	182	130	46	1082
Per cent charge	100	86.1	13.9	10	3.5	82.6
Inspections						
Gravity ° A.P.I.	25.6	24.8	....	20.5	16.1	25.2
Vis. S.S.U. at 210 ° F.	157.3	164.5	....	816	3860	1483
Color O.D.	3250	2093	11970	13315	28960	750
Carbon residue %	2.33	2.19	....	6.8	12.5	1.73
Flash C.O.C. ° F.	550	550	....	605	635	550
Pour ° F.	....	0	....	....	....	0
M.P. A.S.T.M. ° F.	....	....	131	....	....	....

PROPANE STREAMS

	Dewaxing propane	Wax wash propane	Deresining propane	Resin-wash propane
Quantity B.P.D.	3400	650	6600	2000
Per cent charge	260	50	510	153

TABLE 5—DERESINING OF BRADFORD CYLINDER STOCK KENDALL REFINING CO. INSPECTIONS OF RESINS AND DERESINED OIL WHEN PRECIPITATING 13 PER CENT RESINS

Inspections	Deresined oil	Resins
Gravity ° A.P.I.	26.2	19.4
Vis. S.S.U. at 210° F.	116.7	1151
Color O.D.	328	12650
Carbon residue %	1.14	7.9
Flash C.O.C. ° F.	530	635
Pour ° F.	0	....

TABLE 6—PROPANE DEWAXING OF REDUCED NEUTRAL KENDALL REFINING CO. AVERAGE OF SEVEN CONSECUTIVE DAYS

Quantities	Average B.P.D.	Per cent charge
Charge	1220	100
Dewaxed oil	995	81.6
Net wax	209	17.2
Loss	16	1.2
Inspections	**Charge**	**Dewaxed oil**
Gravity ° A.P.I.	31.7	29.9
Vis—S.S.U. at 210° F.	43.2	44.8
Vis—S.S.U. at 100° F.	142.3	174.9
Pour	90	—5

The plant has thus accomplished everything that was anticipated in the production of neutral oil and wax. Of course the increase in yield and decrease in operating cost in the case of the neutrals are relatively small as compared with the increase of 8 to 9 per cent yield in dewaxing cylinder stock to zero pour test and the decrease in the cost of producing finished bright stock. However, the neutral operation does produce subzero pourpoint oil with high yields and low operating cost. The saving in the manufacturing cost of producing bright stock may be considered as entirely due to the decrease in percolation cost if the cost of deresining is charged to dewaxing, because the combined operating cost of this plant is approximately equal to the cost of the previous method of dewaxing. However, if the deresining operation bears its proper proportion of the cost, there has been a material reduction in the cost of dewaxing. The only real criterion, however, is the reduction in the manufacturing cost of producing zero pour bright stock which has satisfactorily fulfilled the original expectations.

For the purpose of determining the cost of operating a plant of this kind, the utilities shown in the summary of the test run for zero pour-test bright stock may be used as quite representative, with the exception of water, which is only 30 per cent of the normal requirements because of its low temperature (40° F.)

While the plant was designed to be operated with one operator and three helpers, one extra helper has been used to date since none of the men had previous experience in the operation of this type plant. It is planned, however, to reduce the number of helpers to the design basis in the very near future, since experience has demonstrated that the extra helper is not required.

Using these data, it is possible for any refiner to establish the direct operating cost of this type of plant in his refinery, but for most plants of this size, where steam costs about 30 cents per 1,000 pounds and electricity about 5 cents per K.W. hour, it will be from 25 to 30 cents per barrel of charge, exclusive of maintenance and depreciation. For dewaxing only, as in the case of neutrals, the cost will be somewhat lower because of the smaller amount of propane to be evaporated, and will usually range between 18 and 23 cents per barrel of charge.

With this fulfillment of the aim to decrease the cost of producing finished oil, attainment of all of the objectives of the Kendall Refining Co. has been accomplished. The plant has not only met its guarantees in every particular, but has also accomplished everything expected of it at the time of installation.

Summary:

After thorough study of processes available for decreasing the cost of producing Pennsylvania lubricating oils, the Kendall Refining Co. installed a propane dewaxing and deresining plant in its refinery at Bradford, Pa. Laboratory tests had indicated that this combination process would attain the four major objectives, and the operation of the plant has completely substantiated all predictions regarding its performance. The objectives and the manner of their attainment are summarized below:

1. *Decrease the cost of dewaxing:*
   The propane plant has reduced the cost of dewaxing both cylinder stock and neutrals, with the major savings in the case of the former.
2. *Improve the yields on dewaxing:*
   The yield of dewaxed oil from cylinder stock has been increased to 86 per cent of zero pour and 90 per cent of plus 20° F. pourpoint. The yield from neutrals has been increased to at least 82 per cent of —5° F. pour and approximately 84 per cent of zero pourpoint.
3. *Decrease the cost of decolorizing:*
   By removing only 3 or 4 per cent of resins, equivalent to the amount previously lost by percolation, the cost of decolorizing has been reduced by more than 50 per cent.
4. *Increase the capacity of the decolorizing plant:*
   Deresining to the extent of 3 to 4 per cent has so reduced the clay requirement that the decolorizing plant is already operating at 80 per cent above its previous capacity.

The plant having attained all of its objectives and met all if its guarantees and expectations, the refinery is now making minor revisions to increase still further the capacity and yield and to permit even further reductions in manufacturing cost.

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Lead Sulfide a Doctor and Dry Sweetening Agent

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It has been known for a long time that lead sulfide is particularly effective as a sweetening agent in conjunction with doctor sweetening. The extent of its activity in this process has been investigated by plant tests. The results of these tests along with experimental work showing the applicability of lead sulfide to dry sweetening are the subject matter of this paper.

The presence of sulfur, and particularly mercaptans, in light petroleum distillates has long been a source of trouble to the refiner and the cause of considerable investigation by the petroleum chemist, resulting in the publication of much valuable literature on the subject. Among those whose work we have found useful in the interpretation of the plant test data on which this paper is based are Wendt and Diggs,[1] Morrell and Faragher,[2] Lachman,[3] Happel and Robertson,[4] and Catlin.[5,6]

To facilitate our test work it was necessary to use the most rapid and, at the same time, reliable analytical procedures available. For analysis of doctor solutions we used the ordinary volumetric methods for sodium hydroxide and salts and the method of Schuessler and Todd[7] for the determination of dissolved lead by titration with ammonium molybdate solution, using tannic acid as an outside indicator. The analytical scheme which we have followed for sulfur compounds in petroleum distillates is based mainly on the procedure of Faragher, Morrell and Monroe,[8] substituting for their mercaptan sulfur determination that of Bond,[9] which consists of titrating the distillate directly with copper oleate solution.

There are many forms of sulfur compounds occurring in gasoline, but it is generally accepted that they may be classified as follows:

Hydrogen sulfide	H_2S
Elementary sulfur	S
Mercaptans	RSH
Disulfides	R_2S_2
Sulfides	R_2S
Thiophenes	C_4H_4S

Of these, the only compounds affected by doctor sweetening are the first three, and these are the only forms of sulfur which have been ordinarily determined in this work. The difference between the sum of these three and the total sulfur, has been designated as residual sulfur. All of this work, however, has been with stabilized gasoline containing nothing lighter than the butane, and in no case was hydrogen sulfide (B.P. —76° F.) present. Table 1 shows typical analyses of a high sulfur gasoline both before and after sweetening.

TABLE 1—SULFUR ANALYSES OF GASOLINE BEFORE AND AFTER SWEETENING

	Sulfur, % by wt.	
	Sour distillate	Sweetened distillate
Elementary sulfur	0.000	0.010
Mercaptan sulfur	0.018	0.000
Residual sulfur	0.151	0.170
Total sulfur	0.169	0.180
Sulfur added	0.016	....
Total	0.185	0.180

Mercaptans are present in almost all raw light distillates to some extent, and are undesirable due mainly to their foul odor, and except for hydrogen sulfide they are the only form of sulfur positive to the doctor test. Any gasoline containing mercaptans is called "sour," and either the entire removal of mercaptans from a gasoline or their conversion to a less disagreeable form of sulfur results in a "sweet" gasoline, or one which is negative to the doctor test.

Plumbite Sweetening

The most common method of sweetening is the conversion or oxidation of mercaptans to disulfides by mixing the sour distillate with sodium plumbite solution and adding elementary sulfur unless it happens to be present in the sour naphtha in sufficient quantity.

Sodium plumbite or doctor solution is a solution of litharge in an aqueous solution of sodium hydroxide according to the following equation:

$$PbO + 2NaOH \rightarrow Na_2PbO_2 + H_2O \qquad 1$$

A large excess of sodium hydroxide is necessary for this reaction, however. The solubility of litharge in caustic soda solution of different strengths at 195° F. and 60° F. is shown in graphical form in Figure 1.

The sweetening of petroleum distillates with doctor solution is a complicated chemical process, but the mechanism of the process is generally accepted as follows (1):

$$2\,RSH + Na_2PbO_2 \rightarrow Pb\begin{matrix}RS\\RS\end{matrix} + 2\,NaOH \qquad 2$$

$$Pb\begin{matrix}RS\\RS\end{matrix} + S \rightarrow PbS + R_2S_2 \qquad 3$$

The mercaptan is converted to mercaptides quantitatively as shown by a comparison of the sulfur analyses in Table 1 where the 0.018 per cent mercaptan sulfur in the sour gasoline shows as a gain of 0.019 in the residual sulfur of the sweetened product. The dissolved litharge is converted to lead sulfide, which reacts in a variety of ways which will be discussed later.

In typical plant tests conducted by the authors at one of the Socony-Vacuum refineries, the raw gasoline, to which a controlled amount of elementary sulfur was added by bypassing part of the stream through a sulfur tower, was mixed with doctor solution in a centrifugal pump in the ratio of 8 gallons of doctor solution per barrel of gasoline. The discharge from the pump passed through a series of vertical pipes, each about 6 feet tall and each connected with the next by a pipe turn. This gave a little additional mixing. It then passed through two settling tanks in series, the gasoline from the last going to the finished-gasoline tank and the doctor solution being either recirculated or pumped to the doctor recovery plant. The doctor solution was reused until a qualitative test showed only a trace of dissolved lead remaining.

Doctor Recovery

The speed of recovery and the extent to which a doctor solution can be recovered have been studied in these plant tests and it is found that after a certain length of time the reagent loses its power to keep lead in solution. As a rule the used doctor solutions on being returned to the recovery system contained 0.3-0.5 gm. PbO/100 cc. (0.025-0.042 lbs./gal.) and an excess of suspended lead sulfide.

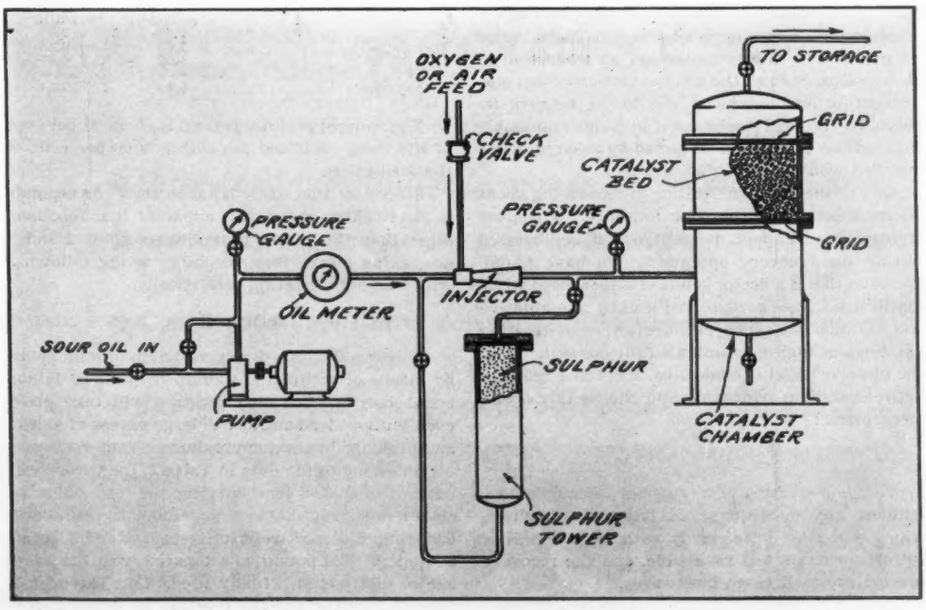


Fig. 2—Flow diagram for dry sweetening pilot plant

The strength of the caustic was 19° Be.

An agitator of the turbo mixer type was used for the recovery. This functions by stirring in such a manner that air is sucked into the solution, converting the lead sulfide back to plumbite according to the following equations:

$$PbS + 2O_2 \rightarrow PbSO_4 \quad (4)$$

$$PbSO_4 + 4NaOH \rightarrow Na_2PbO_2 + Na_2SO_4 + 2H_2O \quad (5)$$

All recoveries were made at 180° F., and Table 2 indicates the amount of dissolved lead after each recovery for two batches of doctor solution designated as A and B. These recoveries were handled in 800-gallon batches.

TABLE 2—DATA ON RECOVERY OF DOCTOR SOLUTIONS

Batch A

GM.PbO/100 cc. = 2.60

Recovery No.	Dissolved PbO after recovery GM./100 cc.	Dissolved PbO after recovery Lbs./gal.	Time (hrs.)
1	2.29	0.19	5
2	2.80	0.23	5
3	2.07	0.17	5
4	2.31	0.19	5
5	2.26	0.19	5
6	1.82	0.15	5
7	2.63	0.22	5
8	2.08	0.17	5
9	2.28	0.19	5
10	*1.64	0.14	8
11	*1.23	0.10	10

Batch B

GM.PbO/100 cc. = 2.29

Recovery No.	Dissolved PbO after recovery GM./100 cc.	Dissolved PbO after recovery Lbs./gal.	Time (hrs.)
1	2.16	0.18	5
2	2.30	0.19	5
3	2.41	0.20	5
4	2.74	0.23	5
5	2.76	0.23	5
6	2.42	0.20	5
7	2.29	0.19	5
8	1.86	0.16	5
9	*1.15	0.10	8
10	*1.35	0.11	8
11	...	...	..

*Although fresh litharge was added in these cases, the solution would not take it up.

It is noted that after about 9-10 recoveries the lead oxide content dropped off rapidly. The dissolved lead after the last recovery had been reduced to such an extent that after being used once more it was entirely used up, and sodium mercaptide was formed, rendering the batch unfit for further recovery. In this case the lead sulfide was allowed to settle and was recovered. The solution was either discarded or used for caustic washing. The reason for this falling off was due, no doubt, to the building up of sodium sulfate by Equation 5. This accumulation of the sulfate ion in the solution would cause the reaction to be reversed because lead sulfate is an insoluble salt. There is also an increase in the carbonate ion by extraction of carbon dioxide from the air, the carbonate ion also preventing lead solubility due to the relative insolubility of lead carbonate. It is also probable that sodium thiosulfate is formed by side reactions, and this would have a similar effect.

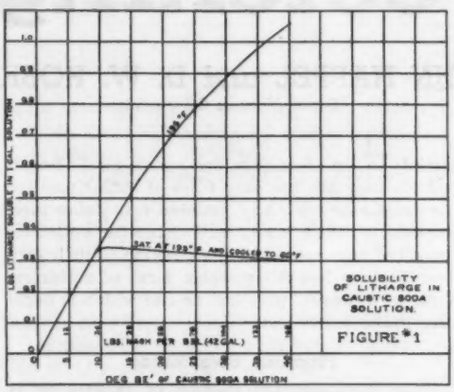
One of the main difficulties in recovering spent doctor solutions is the odor nuisance. If sodium mercaptides are spent, mercaptans will be liberated during the recovery operation. We have found, however, that if a doctor solution is recovered while it still has a trace of dissolved lead by a qualitative test no odor nuisance exists even from treating gasolines of high mercaptan sulfur content. When the dissolved lead is exhausted, there is a reaction between sodium hydroxide and the weakly acidic mercaptans[4]:

$$RSH + NaOH \rightleftharpoons NaRS + H_2O \quad (6)$$

This is a solution of mercaptan in caustic soda without any subsequent oxidation to disulfide, which will take place slowly with large excess of sulfur. Reaction 6 is reversible, and the recovery process forces it to go backwards.

Lead mercaptides of the lower boiling mercaptans are insoluble in gasoline[1] and settle out into the doctor solution without the addition of sulfur. It may be pointed out that these mercaptides must also be converted to organic disulfide and lead sulfide, or this also will behave similarly to sodium mercaptide as described above and produce an odor nuisance in the doctor recovery operation.

It has been reported that doctor recovery can take place to a certain extent without removing the spent doctor from the sweetening system. This



is done by the injection of air into the doctor solution just as it mixes with the gasoline. This addition of oxygen into the system evidently reacts with the lead sulfide according to Equations 4 and 5 as the lead sulfide is formed.

The recovery of doctor is described above in its simplest terms. Lead sulfide also plays a part in both sweetening and recovery as will be discussed below.

Effect of Lead Sulfide on Doctor Sweetening

It is seen that in the simple doctor reactions 2 and 3, one mol of dissolved lead is stoichiometrically equivalent to two mols of mercaptan, or 3.48 pounds of litharge is equivalent to 1 pound of mercaptan sulfur. Likewise, one atom of sulfur is equivalent to two mols of mercaptan sulfur or 0.5 pound sulfur per pound of mercaptan sulfur. Data from three plant tests, as shown in Table 3, indicate that less than the theoretical amount of these chemicals is used.

TABLE 3—CONSUMPTION OF DISSOLVED LEAD OXIDE AND SULFUR/LB. OF MERCAPTAN SULFUR

	Lbs. PbO/lb. mercaptan sulfur	Lbs. sulfur/lb. mercaptan sulfur
Test 1	1.54	0.35
Test 2	1.83	0.36
Test 3	1.62	0.27
Average	1.66	0.33

The amount of litharge used is about 48 per cent of the theoretical and the sulfur is 66 per cent of the theoretical.

Since less lead oxide is taken than corresponds to the reaction above, it is apparent that reactions other than the simple plumbite reactions 2 and 3 are taking place. One possibility is the following with lead sulfide acting catalytically.

$$2\,RSH + S + 2NaOH \rightarrow R_2S_2 + Na_2S + 2H_2O \quad (7)$$

This reaction is a direct oxidation of mercaptan by means of sulfur and sodium hydroxide. It has been observed that this reaction will take place even without lead sulfide. A large excess of sulfur and prolonged agitation are, however, necessary.

Referring to the data in Table 3, the theoretical amount of sulfur for changing the lead oxide as shown to lead sulfide is 0.22 pound, 0.26 pound and 0.23 pound, respectively for tests 1, 2, and 3, or an average of 0.24 pound as compared with the average of 0.33 pound actually used. This leaves 0.09 pound of sulfur for the reaction as given above, but total sulfur used is 0.17 pound less than the amount necessary for the oxidation of a pound of mercaptan sulfur, indicating that 0.34 pound of mercaptan sulfur must have been oxidized by air with lead sulfide acting as a catalyst.

$$2\,RSH + 1/2O_2 \rightarrow R_2S_2 + H_2O \quad (8)$$

It may be pointed out that the doctor solutions were well saturated with air not only from the air introduced during the recovery operation, but also by air picked up when they were pumped from the recovery system into the doctor storage tank.

It is interesting to note that practically twice as much of the mercaptan is oxidized by oxygen as by sulfur with lead sulfide catalysis, and it is seen that roughly one-half of the mercaptan sulfur is oxidized by lead originally dissolved in the doctor solution, the other half by lead sulfide, oxygen and sulfur with oxygen doing twice as much as the sulfur in this case.

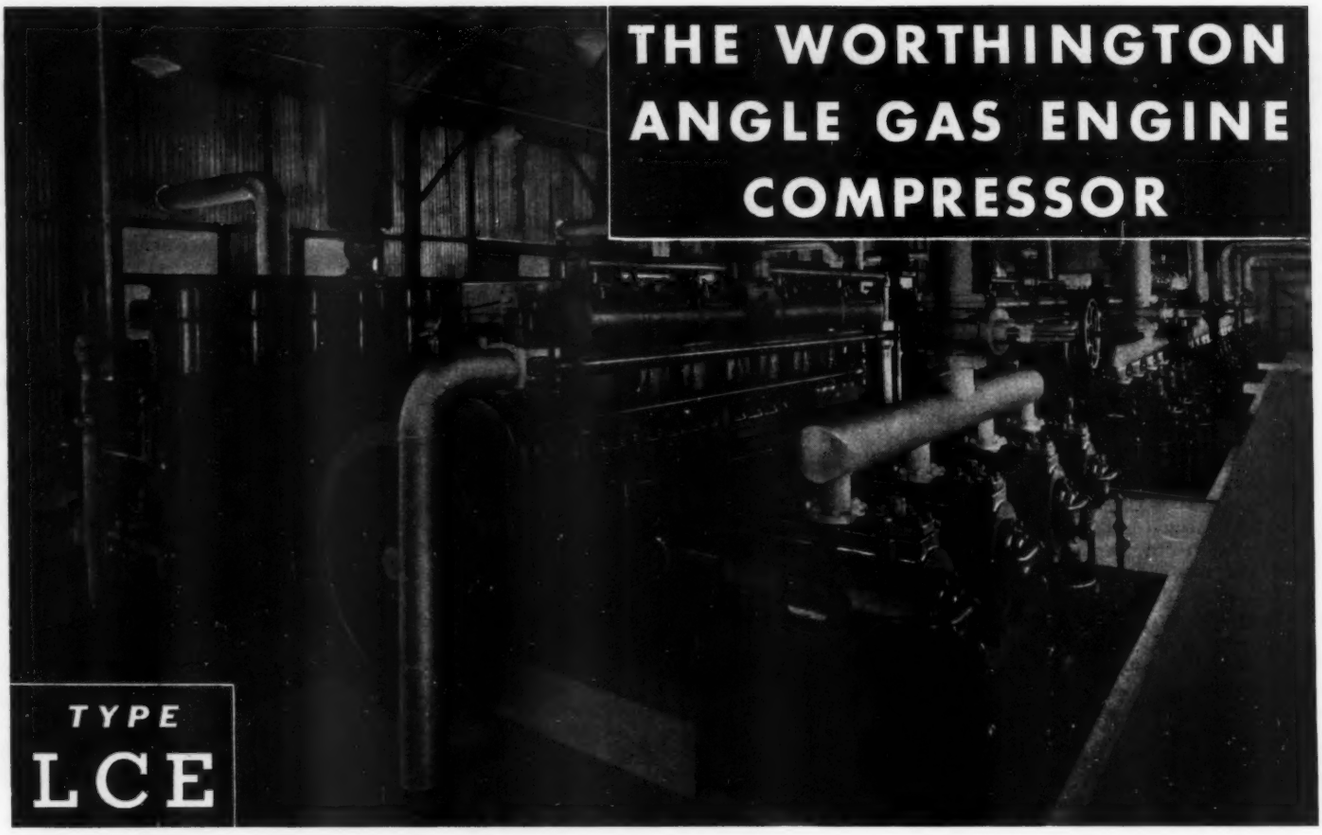
It is possible that the oxygen present acts in conjunction with the sulfur in oxidizing the lead mercaptides to organic disulfides.[2]

$$2Pb\begin{matrix}RS\\RS\end{matrix} + O_2 \rightarrow 2R_2S_2 + PbO \quad (9)$$

The lead oxide produced in this reaction would readily redissolve, explaining in part at least the reason that less lead than required is apparently used, because if any redissolving of lead took place in the process, the difference between the lead content of a doctor solution before and after using would not be a true measure of the amount of lead actually entering into the reaction. Lead sulfide is readily oxidized to lead sulfate, and it is probable that reactions 4 and 5 are also taking place to a certain extent. It is thus seen that the exhaustion of dissolved lead in a doctor solution so that it requires a recovery operation is due in part at least to the consumption of all oxygen dissolved in the doctor solution from its previous regeneration.

In some of this work, even though the theoretical amount of sulfur was not consumed by the actual doctor reactions, it was necessary to add more than the theoretical amount in order to "break" the lead mercaptide, but in each case it was found by analysis that there was a gain in elementary sulfur in the sweetened gasoline, and after deducting this gain from the amount added, the amount of sulfur actually used in the reaction always checked that shown in Table 3. It is interesting to note that even in these cases where an excess of sulfur was present, the oxygen continued to play its part in the sweetening process to the exclusion of the excess sulfur. This is borne out by a comparison of the sulfur analyses in Table 1. Of the .016 per cent elementary sulfur added, .010 per cent shows up as elementary sulfur in the sweetened gasoline and did not enter into the reaction. The other .006 per cent is just 67 per cent of that required to sweeten the mercaptan present in the sour naphtha, and this .006 per cent checks the difference of .005 per cent between the sour naphtha with added sulfur and the sweetened naphtha total sulfur. It was necessary to add excess sulfur only in sweetening naphthas of extremely high mercaptan sulfur content, such as those derived from cracking Luling or Mexican crude, and the elementary sulfur which remained in the sweetened product was not enough to give a positive copper-strip corrosion test in the absence of mercaptans.[10] If more efficient mixing apparatus had been available, however, it is probable that no excess sulfur would have been necessary to produce a "break."

In order accurately to study the effect of sulfur, oxygen, and lead sulfide in sweetening gasoline, a method of sweetening continuously, using only these three materials, was developed. This was done by impregnating a porous material such



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as clay, boneblack, or activated alumina with an aqueous solution of lead acetate and drying. This material was placed in a tube and dry hydrogen sulfide was passed through it to convert the lead acetate to lead sulfide. Using such a catalyst deposited on activated alumina, the effect of using sulfur and oxygen each separately in solution in the gasoline, as well as the effect of both together, was determined. First the sour gasoline itself was passed through a tube of lead sulfide catalyst and no sweetening took place; sour distillate to which sulfur had been added was passed through also with no effect. When gasoline to which oxygen had been added was passed through a tube of lead sulfide catalyst, however, the gasoline was sweetened for about three hours running time, and then became positive to the doctor test. Then by introducing sulfur into the gasoline stream along with the oxygen, this same tube of catalyst continued to sweeten for over 100 hours without showing any signs of losing its activity. The catalyst for these experiments consisted of 4 grams of lead acetate deposited on 36 g. of activated alumina (16 by 30 mesh) and converted to sulfide. The rate of flow through the catalyst was maintained at 10 cc./min.

The continued activity of the catalyst when using sulfur and oxygen was determined by finding the maximum sweetening rate, which was 20 cc./min., and raising the rate to this maximum periodically throughout the run. Any decrease in the activity of the catalyst would have resulted in lowering of this maximum rate. This did not occur, however.

It is apparent from this that oxygen is absolutely necessary for sweetening with lead sulfide and that sulfur also is needed to a lesser degree. The exact mechanism for sweetening under these conditions has not been determined, but it seems that what is taking place must be analogous to the doctor recovery reactions 4 and 5. With that assumption, the following tentative mechanism is given:

$$PbS + 2O_2 \rightarrow PbSO_4 \qquad 10$$

$$PbSO_4 + 2RSH \rightarrow Pb\begin{matrix}/SR\\ \backslash SR\end{matrix} + H_2SO_4 \qquad 11$$

$$Pb\begin{matrix}/SR\\ \backslash SR\end{matrix} + S \rightarrow PbS + R_2S_2 \qquad 12$$

It is known that lead sulfide oxidizes readily to lead sulfate, and by analysis we have found both sulfide and sulfate present in the used catalyst. It is noted that according to this mechanism sulfuric acid is formed, but we have never been able to detect any acidity in this product.

Experiments performed using lead oxide and lead sulfate mixed with the carrier also worked equally as well as lead sulfide, and after a time the presence of lead sulfide was noted in the catalyst, indicating that the reaction was proceeding as above. The difficulty with using the insoluble lead salts, however, is that they are merely mixed with carrier, and after a time the heavy lead salt sifts down through a loosely packed bed of this type and becomes concentrated at the bottom instead of remaining uniform throughout the bed.

Dry Sweetening With Lead Sulfide

For many years the sweetening properties of lead sulfide have been recognized, but it was generally considered that the presence of aqueous sodium hydroxide was essential for effective sweetening. The results of these experiments, however, presented the possibility of lead sulfide as an agent in a dry sweetening process.[11] Dry sweetening in general has many advantages over the present effective but awkward doctor sweetening process. Some of the outstanding advantages of dry processes may be itemized as follows:

1. The recovery process takes place automatically in the catalyst with no possibility of an odor nuisance.

2. There is no loss of naphtha by emulsions with caustic solution.

3. There are no aqueous solutions to manipulate in the very cold weather.

Others[12, 13, 14] have recognized these advantages and several so-called "dry" processes have been developed in recent years, but none has appeared as yet generally capable of replacing the conventional doctor process, although in some cases these processes have found commercial applicability, especially those processes using copper salts.

After the preliminary small-scale experimental work, described above, the process was tried on a pilot-plant scale at 10 bbls. per hour. A flow diagram of the pilot plant is shown in Figure 2. Lead acetate was impregnated on 16 by 30-mesh boneblack, which had been shown by experiment to be as effective as activated alumina for a carrier. Thirty pounds of lead acetate was used to 150 pounds of boneblack. Raw cracked naphtha was used as a charging stock, and sulfur and oxygen were added in slightly more than the theoretical amounts. After 94 hours of complete sweetening, the treated naphtha became positive to the doctor test, and analysis of the feed and treated naphtha showed that only 75 per cent of the mercaptan sulfur was being converted to disulfide. Analysis of the catalyst for lead showed no loss, but inspection showed that a considerable quantity of gummy material had been deposited on the catalyst.

It was found that this gum was soluble in a mixture of benzol and acetone, and reasonable restoration of the catalyst could be accomplished by such washing. The gum was recovered from the wash by distilling off the solvent. Analysis of the gum showed that it was about 11 per cent sulfur, and both sulfides and sulfate were found present. The assumption is that disulfides and polysulfides formed in the sweetening process were extracted from the naphtha by the boneblack, and this gummy deposit prevented proper contact between the naphtha and catalyst.

This process is not developed yet in full detail, but the sweetening reaction with lead sulfide, oxygen and sulfur in the dry state is definite, and it remains to develop a method to prevent the gum formation or to remove the formed gum more completely. The products sweetened in this manner are comparable in every way to those sweetened by the conventional doctor method as regards color, color stability, gum, oxygen bomb induction period, etc. This is not true of some of the dry sweetening processes, which are applicable only to straightrun distillates.

It is apparent, therefore, that although sweetening with lead sulfide in various forms has been in use for many years, it has possibilities other than those suggested hitherto, and the development of new processes involving other chemicals has not antiquated lead sulfide as a sweetening agent.

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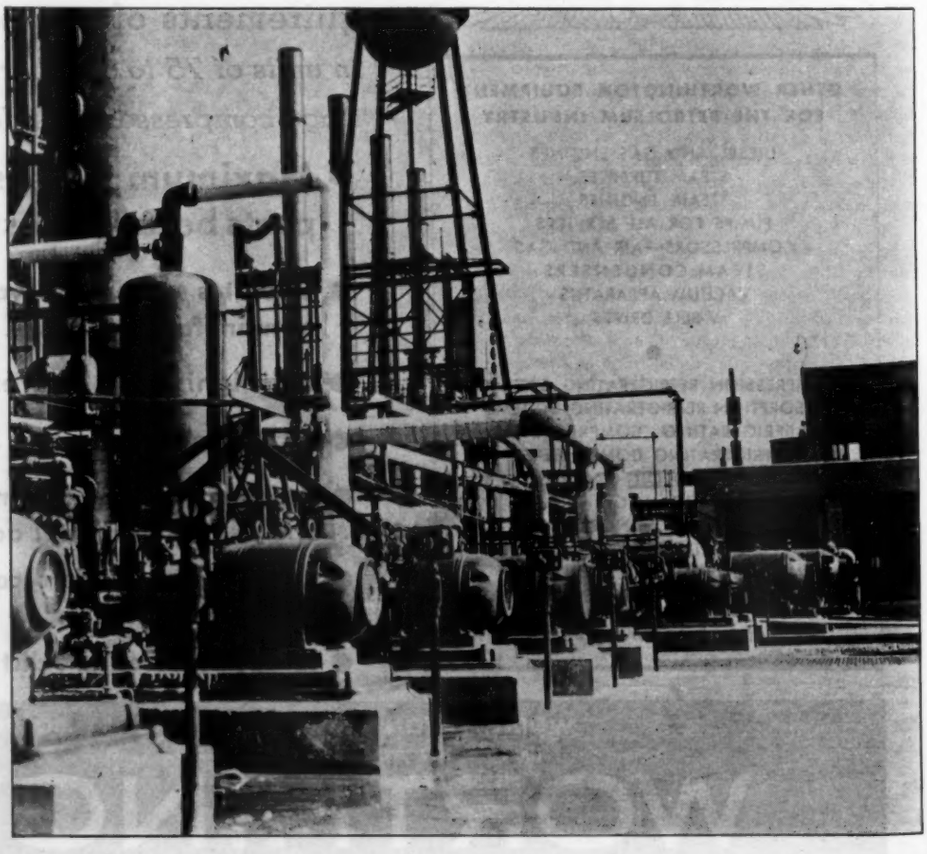

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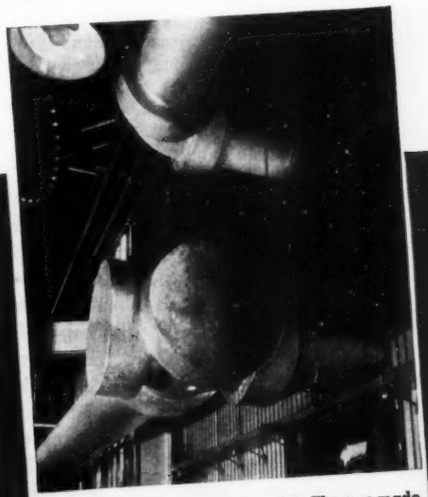

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Tetraethyl Lead Responsiveness of Two Hydrocarbons

By HAROLD M. TRIMBLE and JULES O. RICHARDSON
Phillips Petroleum Company

There has long been a need for some method of satisfactorily comparing various gasolines in regard to their relative TEL (tetraethyl lead) response or susceptibility. It is not satisfactory to compare the increase in octane number resulting from the addition of a given amount of tetraethyl lead unless the fuels have the same unleaded octane number because even the same type gasoline does not have the same responsiveness at different octane levels. Thus, for example, it is not believed correct to say that a 50 octane number fuel is necessarily more responsive than an 80 octane number fuel if it becomes 60 octane number when 1.0 cc. TEL per gallon is added and the 80 octane number fuel becomes 87 octane number with the addition of 1.0 cc. TEL per gallon. The decrease in "responsiveness" as the original (unleaded) octane number is increased occurs for practically all types of fuels. One of the best examples of this trend is the case of TEL blends of mixtures of the primary reference fuels, iso-octane and normal heptane.

Therefore, it was conceived that by comparing the TEL susceptibility of fuels with the TEL susceptibility of iso-octane—n-heptane blends of the same original octane number, a useful method might be obtained. Expressing relative responses as the ratio of the response of the fuel in question to the response of an iso-octane—n-heptane blend of the same initial octane number will be significant since, by this method, an allowance will have been made for differences in the relative value of octane numbers at various points on the scale. The increase in octane number for any concentration of TEL may be used as the basis of comparison. The increase in octane number resulting from the addition of 1.0 or of 3.0 cc. TEL per gallon is suggested although comparisons at 6.0 cc. TEL may also be of value in certain instances. Figure 1 shows examples of the TEL responsiveness of several types of fuels plotted as cc. TEL per gallon of fuel versus cc. TEL per gallon of iso-octane—n-heptane blend.

To permit the application of this method of comparing fuels, complete TEL curves for the entire range of iso-octane—n-heptane mixtures are necessary. Although this is a simple matter in the lower octane number ranges, some sound means of extending the octane number scale to cover points above 100 octane number is necessary in order to make the system a complete one. Such a system has been devised. It is based on tests run by A.S.T.M. method D 357-34T but it is believed that the difference incorporated in the newer method D 357-37T will not invalidate the data herein presented.

While the L-2 method is being used to a great extent at present, for determining octane numbers it is probable that most experimental and fundamental data are being obtained by use of the A.S.T.M. method, especially since the L-3 method is not operative in the higher octane number ranges.

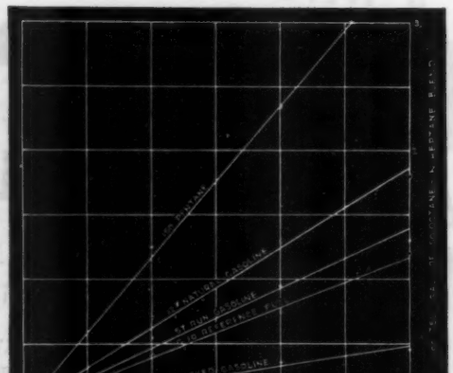


Fig. 1—Examples of TEL response comparisons

Octane numbers up to 100 have thus far generally been determined either directly against iso-octane and n-heptane or through the use of secondary reference fuels already calibrated against these standards. No entirely satisfactory method has been generally available for assigning octane numbers above 100. Blends of iso-octane and benzene have been used as the basis of an arbitrary scale of numbers from 100 to 200. This scale, however, cannot be considered as a continuation of the zero to 100 scale because benzene is not sufficiently better than iso-octane in antiknock value by the A.S.T.M. method. As a matter of fact there is practically no difference between iso-octane and a blend of 75 per cent benzene in iso-octane. Most of the difference in the antiknock value of the two substances lies between benzene and 75 per cent benzene in iso-octane.

It had previously been noticed that the curve of per cent benzene in n-heptane versus octane number was practically a straight line in the high octane number range and the idea was conceived that probably a straight line extrapolation of this curve above 100 octane number to 100 per cent benzene would give values comparable with lower octane numbers.

The following data for this extrapolation were obtained by determining the octane numbers of several blends of benzene and n-heptane in the range of 94 to 100 octane number.

Per cent iso-octane in n-heptane	Corresponding per cent benzene in n-heptane
94.0	86.2
97.0	87.9+
100.0	89.7

When these values were plotted and extrapolated along a straight line, a value of 117.6 was obtained for the octane number of benzene.

By the use of this extrapolation curve, octane numbers could be assigned to the various points of the TEL curves which were above 100 octane number. The curves thus determined were reasonably in line with the trend indicated by those of the other blends.

The primary standard reference fuels were used in this study. In addition to the two base fuels, five iso-octane—n-heptane blends were also investigated. The blends consisted of 25, 40, 55, 70, and 85 per cent iso-octane in n-heptane, respectively. Curves of TEL versus octane number were determined several times for each of the seven samples.

Samples of 100 octane number or less were rated in the usual manner and particular care was taken to keep the knock intensity as nearly constant as possible. Samples of 100 octane number and over were run in the same manner but were matched against benzene in n-heptane.

In order to rate iso-octane plus 6.0 cc. TEL per gallon, which has a higher antiknock value than benzene, it was, of course, necessary for the operator to estimate by extrapolation, a value of more than 100 per cent benzene. The octane number value was then determined by a slight extension of the benzene-n-heptane calibration beyond 100 per cent benzene. Table 1, are the averages of four runs on each of the seven samples except

(Continued on Page 145)

Summary

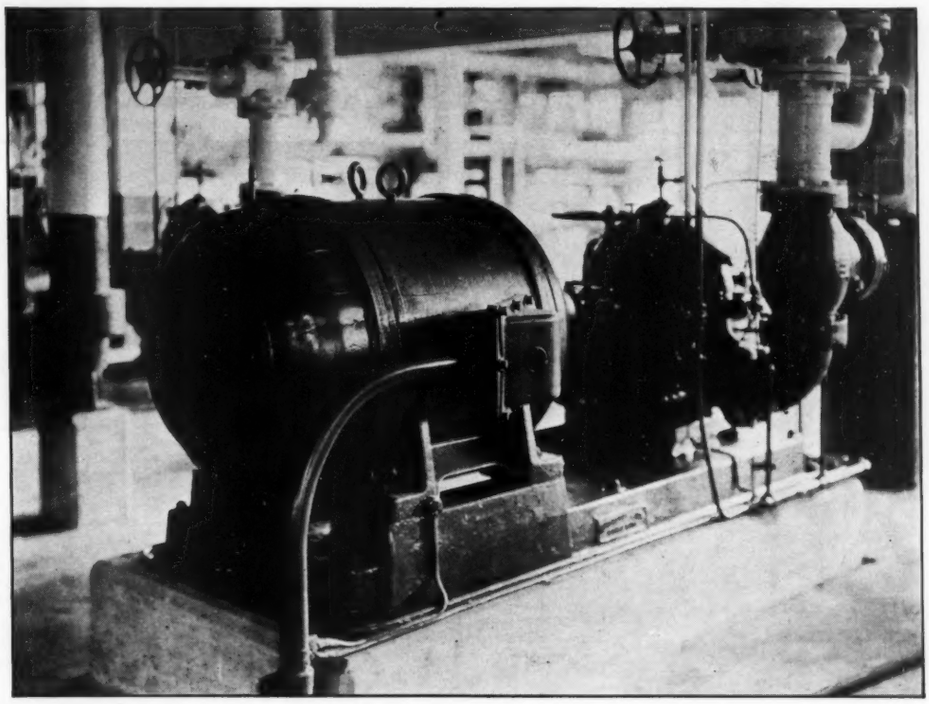
Some satisfactory method of comparing the tetraethyl lead response of various gasolines would be of considerable value for evaluating the various fuels. The comparison of the responses directly is not satisfactory since fuels even of the same types do not have the same responsiveness at different octane number levels. It is therefore suggested that a useful method would be the comparison of the response of the fuels to the response of blends of iso-octane—n-heptane having the same unleaded octane numbers as those of the fuels in question. Thus the relative value of octane numbers at different levels is eliminated.

In order to have a complete system, a means of evaluating octane numbers over 100 is needed. It has been found that a straight line extrapolation of the curve of benzene in n-heptane against octane number to 100 per cent benzene gives octane numbers from 100 to 117.6 which seem to be very comparable to those below 100.

Conversion charts have been prepared for obtaining octane numbers above 100 for TEL in iso-octane to 6.0 cc. per gallon and for benzene in n-heptane to 100 per cent benzene.

How Much Electric Power Is Used in Refining

By W. H. STUEVE
Engineer, Oklahoma Gas & Electric Co.



Seventy-five horsepower, 3,600 r.p.m., explosion-proof induction motor operating centrifugal crude charging pump

This question of "How much electric power does an oil refinery use?" has been propounded so many times, and the answers obtained have been so vague, indeterminate, and subject to such wide variation in passing from one refinery to the next one, that a discussion at this time was deemed timely.

It is a known fact that the adoption of electric power to perform operating functions in the oil refinery has been constantly on the increase for years, due to changes in process which require more and more pumping of the liquids being refined, coupled with improvements of electric motor equipment and pumping equipment.

Outstanding in achievement of the electric motor manufacturer was the development of the explosion-proof motor, permitting its use in hazardous gaseous locations, and the achievement of the pump manufacturer in design of centrifugal pumps of higher speeds and better efficiencies.

Refining operations essentially require the pumping of great quantities of condensing water, and also require the movement or the pumping of the crude oil and products of the refinery against relatively high pressures. In the early days of the industry these operations were performed principally with straightline steam pumps using in some cases as much as 250 pounds of steam per brake horsepower hour, and since steam was necessary in the skimming distillation processes then in vogue, the application of electric power was almost unheard of and rarely considered for use.

However, with the advent of cracking processes requiring higher temperatures, greater pressures, and a more direct application of heat in the stills, more mechanical power was obviously necessary. If steam pumps were used, more investment in the boiler room was necessary, and since the amount available of waste or non-marketable fuels was gradually declining, electric energy in the form of purchased or generated power gradually came into use.

This trend in increased use of electric energy is noticeable within the past several years by an examination of published reports of certain governmental agencies, shown in Table 1.

It is of interest to note from Table 1 that while the daily capacity of over 400 refineries in the United States in three years was increased 5.5 per cent, the amount of purchased electric energy increased almost 20 per cent during the same period, whereas the increase in oil refined was only 12 per cent from 1933 to 1935.

TABLE 1—RELATION OF CAPACITY TO ENERGY PURCHASED, BARRELS REFINED, AND FUELS REQUIRED

Year:	Refineries	Daily capacity of operating refineries bbls. per day	Fuels consumed per barrel of crude therms (100,000 B.t.u.)	Total electric energy purchased kw. hrs.	Thousands of barrels of oil refined
1933	454	3,553,600	6 60	900,468,000	861,254
1934	435	3,614,700	6 38	1,022,984,000	895,636
1935	422	3,749,000	6 15	1,071,841,000	966.243

Also note a decrease of 7 per cent during this period in fuels consumed per barrel of crude charged to the stills, attributed in the main to a smaller use for steam and resulting economy obtained from the increased used of purchased and generated electric power during the period shown in Table 1.

The above statement of electric energy used by all the refineries does not take into account the electric energy generated privately with internal-combustion engines, condensing, non-condensing or bleeder steam engines or turbines, and obviously this information is hard to obtain. However, sufficient information was made available from a study of 44 refineries in the Southwest to give a fairly accurate cross section of what might be expected from a study of the rest of the 378 operating refineries with respect to their total use of electric power.

In order that a more comprehensive analysis might be made of the data collected from these 44 refineries, it was deemed advisable to separate the refineries studied into three general classes: (a) Skimming; (b) cracking; and (c) complete, and such itemized information is disclosed in Table 2.

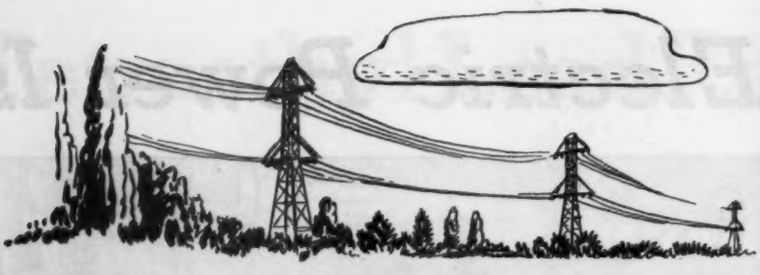
The information in Table 2 represents about 10 per cent of the number of refineries operating during 1935, also 13.3 per cent of the total oil refined in that year, and accounts for 18 per cent of the total electric energy sold to all the oil refineries throughout the states. No doubt, the higher percentage use of purchased electric energy, as compared to the amount of oil refined, can be accounted for in the 44 refineries when consideration is given to the fact that a great many refineries not studied in this analysis are located in the older eastern oil fields and apparently have not been as progressive or efficient as the newer refineries located in Texas, Kansas, and Oklahoma.

A great deal of information can be gleaned from the data shown in Table 2, from which cer-

(Continued on Page 138)

TABLE 2—WEIGHTED AVERAGE REQUIREMENTS OF ELECTRIC POWER, MECHANICAL POWER, CONDENSING WATER, AND STEAM GENERATED

Refining class:	Number of refineries studied	Total barrels, throughput 1935	Total purchased electric power, kw. hrs.	"Electric energy" per barrel of oil throughput: Purchased electric kwh.	Privately generated: Oil and gas engine kwh.	Privately generated: Steam turbine kwh.	"Mechanical energy" per barrel of oil: Oil and gas engine equivalent kwh.	"Mechanical energy" per barrel of oil: Steam engine or turbine equivalent kwh.	Total "electric" and "mechanical" power kwh./bbl. of oil	Average barrels water pumped (50 gal.) per barrel of oil input	Average pounds steam generated per barrel of oil input
(a) Skimming	17	16,300,000	4,890,000	.30	06	0	.05	1 15	1 56	6 6	78
(b) Cracking	17	67,600,000	87,300,000	1 29	.03	0	.51	1 34	3 17	22 3	115
(c) Complete	10	44,000,000	103,000,000	2 34	.25	90	.70	1 42	5 59	24 5	250
Total	44	127,900,000	195,190,000								



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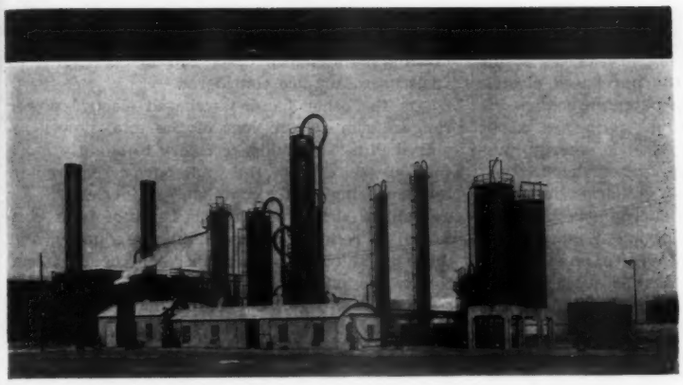

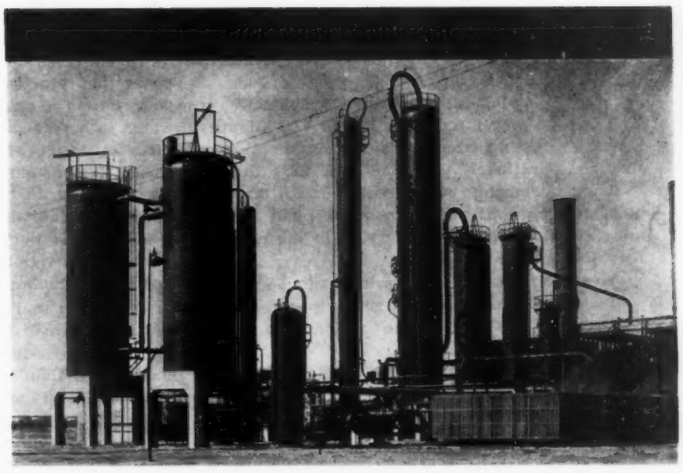

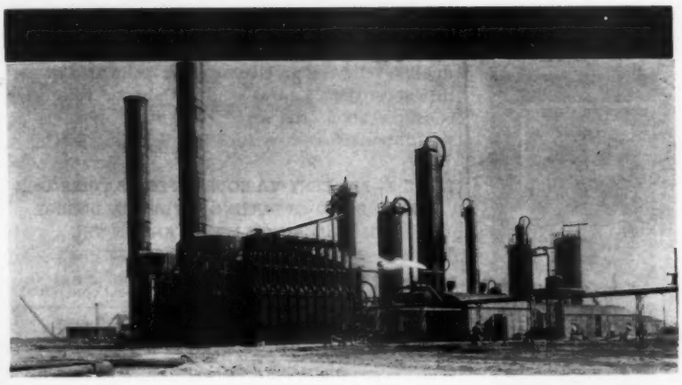

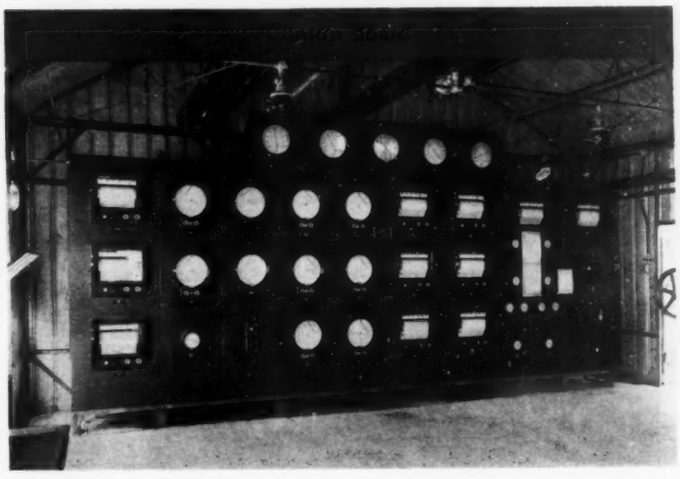

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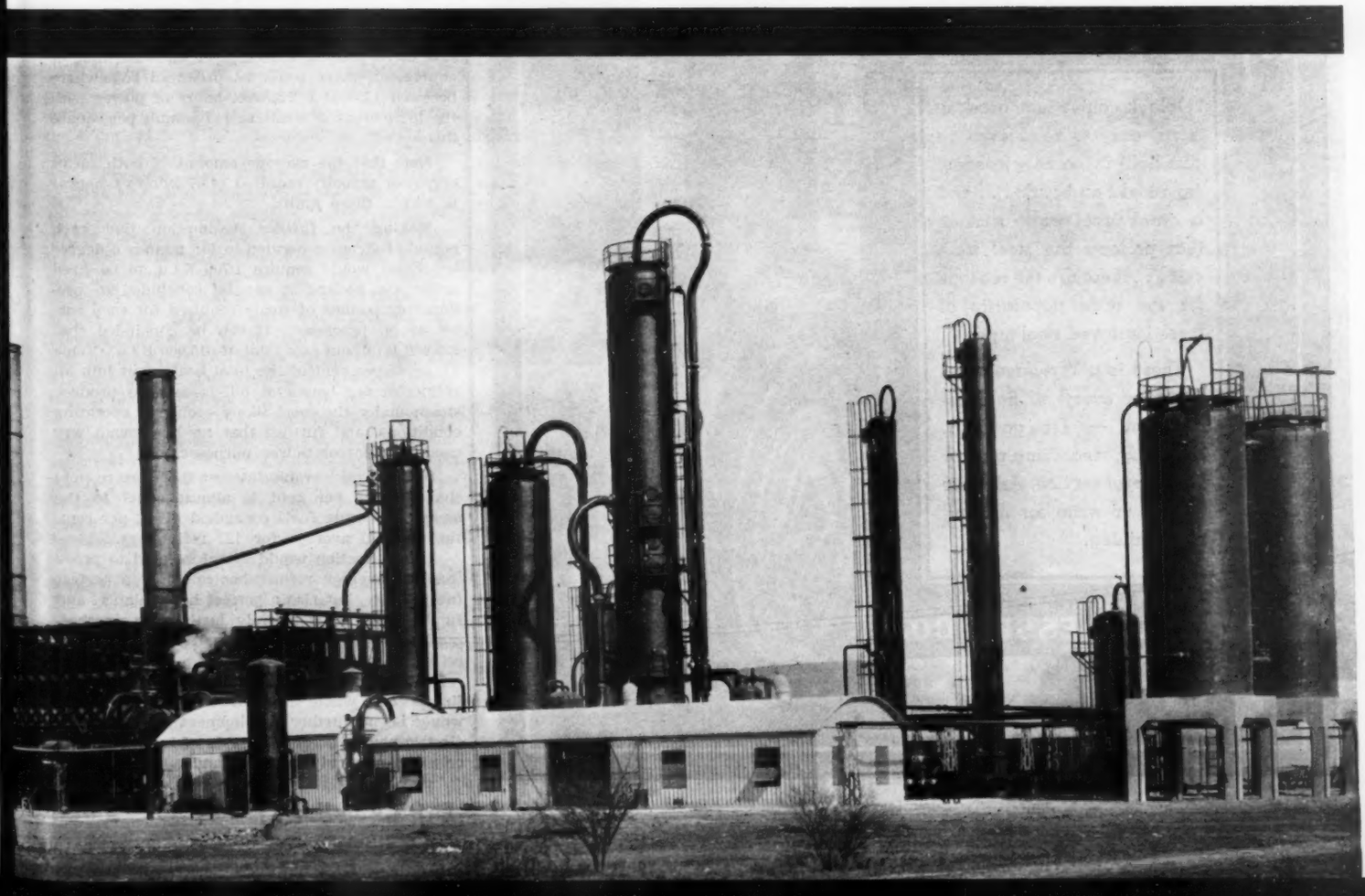


tain trends are very noticeable, all tending to lend considerable merit to the type of information collected in the survey. Among the striking features the accompanying graph.
are the following, as illustrated graphically in

The total power required, 1.56 to 5.59 kilowatt hours, in passing from a plain "skimming" to a "complete" refinery, is in the ratio of 1 to 4.

The condensing water required, 6.6 to 24.5 bbls. of water, in passing from a plain "skimming" to a "complete" refinery, is in the ratio of 1 to 4.

The steam generation requirements, 78 to 250 pounds per barrel of oil charged in passing from a "skimming" to a "complete" refinery, is in the ratio of about 1 to 4 also.

Note, however, that purchased electric power has increased almost eight times, .3 to 2.34 kilowatt hours per barrel of crude charged in passing from a "skimming" refinery to a "complete" refinery.

In the case of "skimming" refineries it appears that practically all the purchased electric energy used is consumed in pumping condensing water, whereas in "cracking" refineries about three-fourths of the total electric energy purchased is consumed in pumping condensing water. However, in "complete" refineries only one-third of the total electric energy purchased is used for this purpose, indicating a more widespread and diversified use of electric power in refineries producing lubricating oils.

The study and data from Table 2 also reveal that a very small amount of electric power is being generated with internal combustion engines, never more than 5 per cent of the total power required in any class of refinery. This can be construed as meaning that it is apparently uneconomical to generate electric power in this manner when all factors of investment and operating maintenance costs and market value of fuels necessary are considered.

On the other hand, purchased electric power ranges from 20 per cent of the total power required in a "skimming" refinery to slightly more than 40 per cent of the total power required in the "cracking" and "complete" refineries.

Table 3 shows the various types of fuels consumed in refineries throughout the country, and their individual relation in per cent of total heat content actually fired.

In Table 3 the waste or nonmarketable fuels, principally shown as acid sludge, refinery gas, and coke, compose 47.52 per cent or almost one-half of the total fuel required to refine a barrel of oil. Some of this waste fuel is direct-fired and the rest used to produce steam. However, some of the waste fuels are sold on the market, but the record does not disclose the actual total production of these particular fuels. It is also of significance that Kansas and Oklahoma refineries consume about the same percentage of fuels as the national average fuel in all refineries.

TABLE 3—PER CENT VARIOUS TYPES OF FUELS CONSUMED IN 422 OPERATING REFINERIES DURING 1935 (BUREAU OF MINES) AND IN THE KANSAS-OKLAHOMA DISTRICT

Fuel—	Avg. heat content B.t.u./unit	Per cent of fuels to total heat consumed: Kansas and Oklahoma refineries	All refineries
Oil	6MM/Bbl.	34 59	31.40
Acid sludge	4.5MM/Bbl.	7.74	3 94
Coal	13M/Lb.	.04	5 35
Refinery gas	1050/C.F.	16 30	14 15
Natural gas	1400/C.F.	39 60	43 00
Coke	15M/Lb.	1.11	.58
Purchased steam	1000/Lb.	0	.96
Purchased electric	3415/Kwh.	.62	.62
Total, per cent		100 00	100 00
Barrels of oil actually refined in 1935		107,752,000	966,243,000
B.t.u. consumed per barrel of oil refined		660,000	615,000

Assuming that all the steam generated (162 pounds/per barrel) were gainfully used, first to produce electric and mechanical power and then to process work at about 30 pounds per square inch gauge, and assuming a reasonable water rate of 80 pounds of steam per kilowatt hour or equivalent, there could be produced somewhere between 1.5 and 2 kilowatt hours of power with the 162 pounds of steam at 148 pounds per square inch.

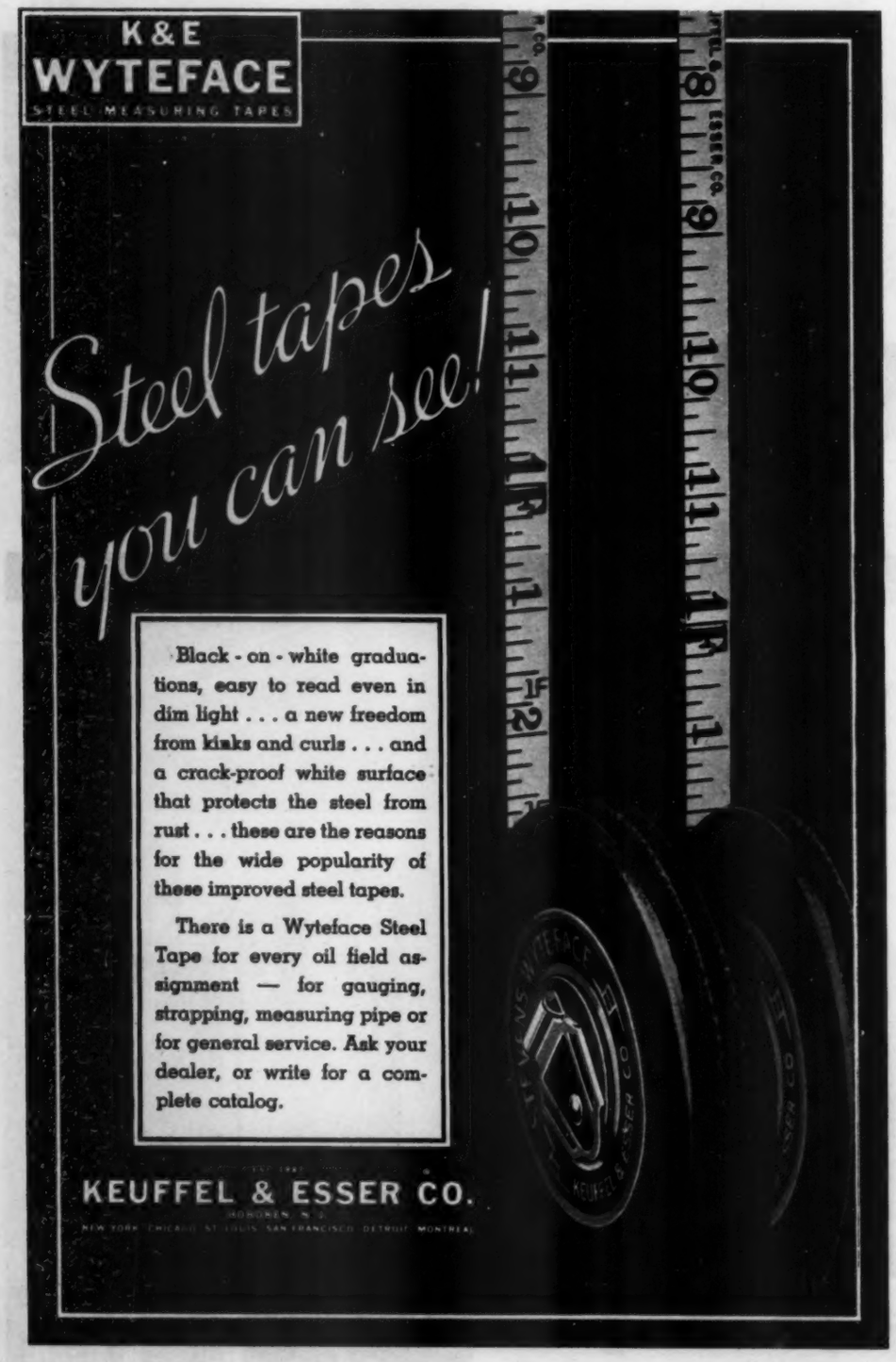
Note that the average amount of both forms of power actually required (1.67 kilowatt hours) is within these limits.

Making the further assumption that each pound of steam generated to 148 pounds 0 degree superheat would require 1,700 B.t.u. to be fired under the boilers, it can be concluded to produce 162 pounds of steam required for each barrel of oil processed. It can be concluded that 275,000 B.t.u. out of a total of 615,000 B.t.u. (Table 3), or 45 per cent of the total heat input into all refineries per barrel of oil, is used to produce steam under the most likely economic operating conditions, and further that no live steam was used for heat or power purposes.

It is of considerable interest therefore to note that this 45 per cent is almost equal to the amount of waste fuels consumed (47.52 per cent, the national average for 422 refineries).

This deduction would therefore tend to prove that the average refiner has not only a perfect fuel balance, but also a perfect heat balance, and further that he is entirely justified in purchasing as much electric power as shown in the 44 refineries studied.

Now one may conclude that in considering refineries as a whole throughout the country, there would be no further development in the use of electric power, because all uses of fuels and power were so evenly balanced and apparently had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reached the proper economic limits in all respects.

This obviously static or balanced condition, however, is rapidly changing, due to new processes which do away with production of acid sludge and petroleum coke in such great quantities. Similarly polymerization can utilize economically perhaps 20 per cent of the present amount of refinery gases, and again the market values of fuel oil in the industrial centers may be so enhanced as to preclude fuel oil for economic use to secure refinery power.

Considering a circumstance where acid sludge (3.94 per cent), petroleum coke (.58 per cent), and 20 per cent of refinery gases (43 per cent),

The data used in preparing the accompanying graph are the results of a nation-wide survey. While the relatively small number reporting does not permit final conclusions to be drawn it is probable that a complete return would reveal the same trend in the purchase of electric power by refiners.

were not being produced and consequently not available for producing steam, there would be a total of 13.1 per cent of 615,000 B.t.u. (reference Table 3), or about one-half kilowatt hour per barrel of oil refined of equivalent power not capable of being generated with back-pressure steam.

It is estimated that all the refineries now have installed perhaps 410,000 horsepower of motors using purchased power, plus an additional 200,000 horsepower of motors using privately generated power, or a total of approximately 600,000 horsepower of electric motors actually in service in the oil refinery industry today.

In sizes these motors vary from 1,400 horsepower induction motors driving hot-oil charging pumps down to the smallest of one-fourth horsepower to operate recording instruments.

Some of the uses for electric motors in the oil refinery are shown below.

1. Lighting.—It is generally considered good practice when about 3 per cent of the total energy required in refining operations is used for floodlighting, tank-lighting, building, lighting, et cetera.

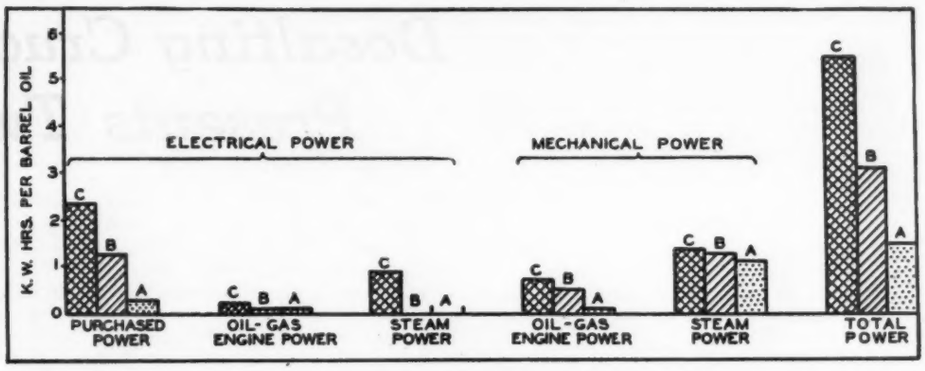
2. Pumping.—(a) Water pumping through condensers requires pressures of about 50 pounds. (b) Water pumping through spray ponds requires pressures of about 20 pounds. (c) Charging pumps for both crude and hot oil. In the case of charging pumps for cracking units, the hot oil is recirculated perhaps 8 or 10 times and pressures of 1,000 pounds are required. (d) Charging pumps for reflux, tars, pitch, and other side products from fractionating columns. (e) Transfer pumps and treating pumps. (f) Boiler feed pumps. (g) Deep well pumps for make-up.

3. Compressors.—(a) Air-compressor for maintenance work, agitating air, tube cleaning, tank and car cleaning. (b) Ammonia-compressors for refrigeration to eliminate paraffin from lubricating oil, and synchronous motors for better power factor throughout the refinery, are usually installed.

4. Welding.—All maintenance, construction, and repair work requires arc welding, and portable motor-driven generators are essential.

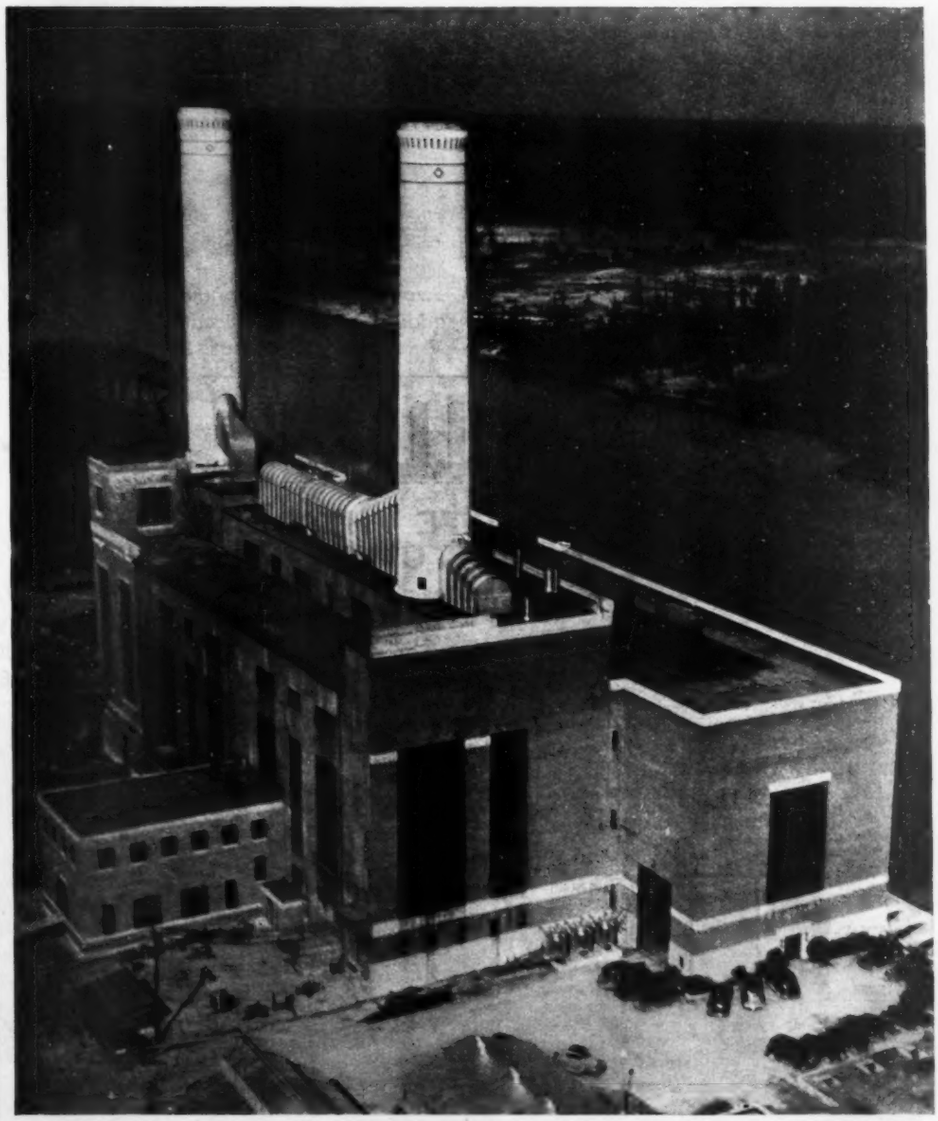
5. Machine shop.—Lathes, drills, pipe-threading machines, hacksaws, grinders, buffers, cranes, planers, and many other applications requiring individual motor drive, are essential in every refinery.

6. Conveying equipment.—In larger refineries, particularly those in which lubricating oil is produced, motors are used to convey sacks,



Relationship of various types of power consumed in refineries. A represents skimming plant; B represents cracking and C a complete plant

NECHES POWER STATION



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drums, cans, and cartons of the finished product. Also, chain and belt conveyors are adapted to move filtration clays, acid sludge, and petroleum coke.

7. Miscellaneous.—Small motors are adaptable to the following uses: (a) Mechanical agitators; (b) mechanical mixers; (c) oil dehydrators; (d) clocks and meters; (e) hoists and trucks.

Summary

Oil refineries, as a general rule, operate at about 73 per cent of their rated capacity.

Practically all oil produced in this country is refined to some extent in the 422 refineries of the United States.

Electric power applications represent 44 per cent of the total power required in oil refineries, of which amount two-thirds is purchased and one-third generated privately.

Generation of electric power with internal combustion engines is apparently uneconomical.

Waste and nonmarketable fuels provide almost one-half the total fuel supply of refineries.

Territorial or district locations of refineries dictate the type of fuels consumed, depending on economic status of transportation costs of such fuels, or market value.

Modern improvements by electric motor manufacturers have provided a wider field for purchased electric power application.

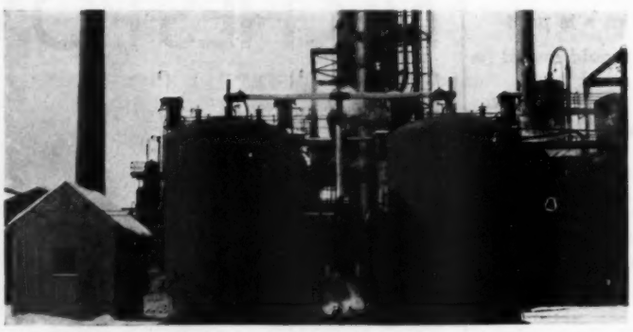
It is estimated that 40 per cent of the total amount of oil refined in the 422 operating refineries is only skimmed, whereas 50 per cent is refined in "complete" refineries, and the rest is refined in combination "skimming" and "cracking" (Class b) refineries.

Additional power required for newer processes as times goes on, apparently should be in form of "purchased electric power" due to overall economies obtainable.

Desalting Crudes in Refinery Presents Two Problems

"The general problem of the determination of salts in crude oils comprises, in reality, two entirely separate and distinct problems," according to C. H. Roberts and R. W. Stenzel. "The first of these consists of the complete extraction from the oil, by suitable means, of the salts contained therein; while the second problem comprises the estimation, in the aqueous extract, of the kinds and quantities of the various substances present. As will be appreciated, the first problem is by far the more difficult of the two and is the one which has engaged the attention of analysts to the greater degree, as is evidenced by the variety of procedures that have been proposed for its solution.

"The reason for the emphasis which has been placed upon this phase of the general problem is due, first, to the difficulties of extraction processes in heterogeneous systems and, second, to the fact that crude oils contain naturally occurring emulsifying agents, whose presence hinders solution of the salts in the extraction medium and impedes its complete separation and recovery for subsequent analysis. The second problem, that of the estimation of the materials extracted from the oil, is relatively simple; involving only the principles and practices of water analysis, which are well known and more or less highly standardized."



Two Petreco desalting units installed in an Ohio refinery. Two additional units are located in this plant. Many are also in plants in Kansas, Kentucky, Michigan and Ohio

The authors continue the discussion with summaries of methods for extraction of salts from crude and methods for analysis of aqueous extract. Complete reports of the discussion are available from the Petroleum Rectifying Co. of California, 714 Security Title Insurance Building, 530 West Sixth Street, Los Angeles, Calif. The research work is especially valuable where the problem involves salt water emulsions.

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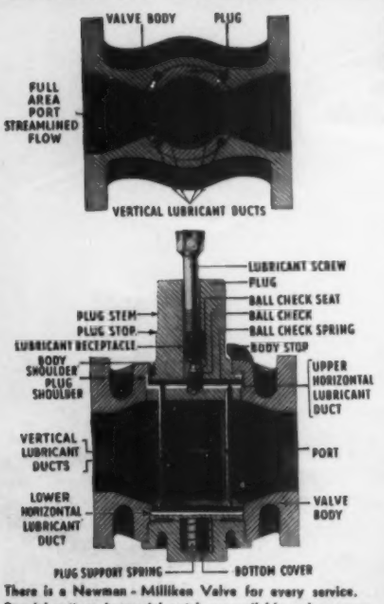

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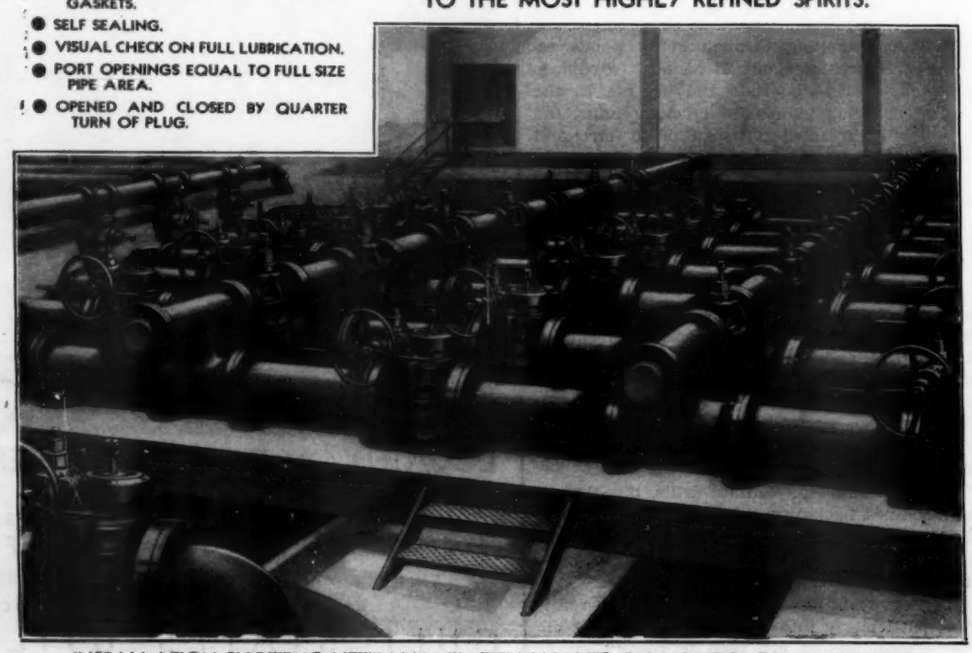

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Development Work Is Centered in Marcus Hook Laboratory

By H. STANLEY NORMAN

Centralization of control and development work has been attained in the new laboratory of the Sun Oil Co. at its Marcus Hook, Pa., plant, one of the largest and most complete refineries of the petroleum industry.

The laboratory building is 171 by 105 feet, containing approximately 25,000 square feet of floor space. Located within the plant property, it adjoins the main office building, which is similar in design and size. The operation of the entire refinery is directed from these two buildings, which overlook the mile-wide Delaware River.

The building and its equipment incorporate the latest developments in laboratory design and working facilities, with several unique features perfected by the management, aided by the engineering and laboratory staffs. Special attention was given to safety of employes. Several of the outstanding features are illustrated in the accompanying pictures.

In building and equipping, minute attention was given to detail and flexibility. One of the unique features is the location of all piping outlets in a center bank entirely independent from tables. This permits removal of tables, thereby opening space for tall laboratory apparatus, which because of ceiling limitations cannot be set up on top of the tables.

Advantages of this arrangement are obvious. Frequently narrow passageways provided between rows of tables fail to afford sufficient space for erection of apparatus necessary for the work involved. Without the removable tables, it would be necessary to set up elaborate apparatus in some improvised location.

Every room in the three-story laboratory building is equipped with water-spray, resembling in appearance the conventional shower-bath outlet. The control on each is at doorknob height and painted red. The water-valve control quite logically would be the first thing to receive attention in case of accident in handling oil-testing apparatus or chemicals.

The Sun laboratory consists of three main divisions each, occupying one floor, with some overlaps necessitated by the close relationship of development work. On the first floor is the receiving-room, where all samples of crude, refined products and metals are concentrated and then rerouted to the division exercising supervision over the particular test or product involved. The metallurgical section and apparatus for the conventional tests on crude oil also are located on the first floor. On the same floor are the facilities for determining crude viscosity, engler distillation apparatus, vapor pressure, gum and carbon content.

Analytical chemical work and special tests are carried out on the second floor. All research and development work is concentrated on the third floor. The various divisions of the laboratory are under the immediate supervision of department heads composed of highly trained men in their individual specialties.

The semiwork laboratory is housed in the main building with part of the quarters extending upward for three stories to permit installation of towers. The semiwork laboratory is the final proving-ground for a new refining process which in many cases has originated in the company's research laboratory in Norwood, Pa., or may be the outgrowth of information regarding products and their reaction under certain conditions gained at some stage in the Marcus Hook plant. All plant control work centers in the laboratory. Only the simplest tests are made at other points in the plant.

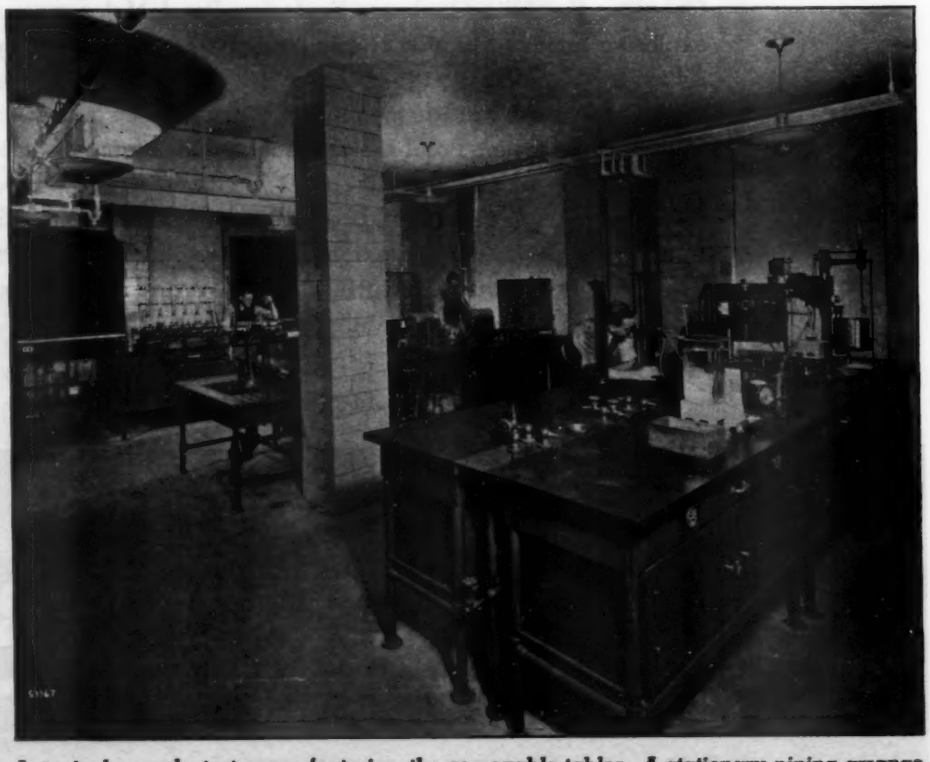
The company's research laboratory in Norwood is operated independently of the Marcus Hook plant. Practices originating in Norwood may find their way to Marcus Hook for final development and application first on a semiwork scale and finally on plant proportions.

For the purpose of obtaining distillation information on quantities of oil beyond capacity of laboratory apparatus, the Sun company has a battery of stills and fractionating-towers of 10- to 100-gallon capacity equipped with condensers, accumulators, and other conventional plant apparatus. These units are located within a few steps of the laboratory building.

Testing methods employed in other Sun laboratories located in Toledo, Ohio, and on the Texas Gulf Coast are standardized at Marcus Hook. The chief chemists from the company's two other laboratories go to Marcus Hook several times a year for discussion of problems and for general correlation of efforts. All instruments are calibrated at Marcus Hook to render data from all sources subject to common interpretation.

Propane is used exclusively for laboratory gas. The fuel system consists primarily of a tank of 1,350-gallon capacity, located outside the laboratory and built for 200 pounds pressure. Two reducing-valves on the laboratory side of the tank lower the pressure within the plant system. Special precautions have been taken in the propane system to guard against failure of the reducing-valves. The first valve lowers the pressure to 10 pounds. Outside the laboratory building, but on the draw-off side of the 10-pound reducing-valve, is installed a 25-pound blowoff. A mercury blowoff is installed on the withdrawal side of the second reducing-valve.

Experience at Marcus Hook has determined propane to be an ideal laboratory fuel. It is independent of the variations in pressure frequently found in utility systems, which may vary widely, dependent on load requirements. Furthermore, propane under constant pressure is one of the most uniform fuels known, making the laboratory tests almost 100 per cent free of errors in heat application. In the case of prolonged distillation tests it is possible to leave apparatus in service overnight or longer with assurance on the part of technicians



A typical sample test room featuring the removable tables. A stationary piping arrangement for water and fuel can be seen in detail in the right foreground

that heat has been applied at a constant rate. Consumption of propane for the Marcus Hook laboratory and office buildings averages about 1,000 gallons each month.

All the plumbing and propane fuel lines between floors are contained in two central shafts at either end of the building. The arrangement permits repairs or alterations without frequent defacement of the walls or floors and thereby eliminates the accompanying confusion and interruption of laboratory procedure.

Physical properties of all metals going into refinery construction are tested in the metallurgical testing section of the laboratory. These tests include still-tubes, exchange-lines, condensers, accumulators, fractionating-towers and tanks. Testing of metals and welds for Sun Shipbuilding & Drydock Co. is also made here. The laboratory is equipped with machinery for making corrosion tests and determinations of hardness and optical equipment for inspecting the molecular structure of materials. Protective coatings of all types are tested in the metallurgical section, which is also called upon to do considerable work in behalf of the production and the pipe line divisions.

The new laboratory was built under the direction of Arthur E. Pew, Jr., vice president in charge of manufacturing for the Sun company. The construction was preceded by a thorough analysis of the refinery's present and probable future requirements, taking into consideration the increasing importance of laboratory control in modern refining.

Dr. J. Bennett Hill, prominently connected with petroleum research and development work for years, is in direct charge of the company's development work, and he is assisted by S. S. Kurtz, Jr., in chemical development, W. H. Barcus in chemical engineering development, and E. S. Ross in specialty development. E. M. Hughes is chief chemist of the refinery. Offices of W. D. Mason, plant manager, and A. W. MacMurtrie, superintendent, are in the plant office building.

TETRAETHYL LEAD

(Continued from Page 130)

for results on blends having octane numbers over 100. In the latter cases the averages are for two tests. Table 2 shows, for various amounts of TEL per gallon, the increase in octane numbers for various percentages of iso-octane in n-heptane.

The use of the TEL curve for iso-octane is a satisfactory method for assigning octane numbers from 100 to 118.7. It is also possible to use per cent benzene in n-heptane for octane numbers up to 117.6.

Two useful means of determining octane numbers above 100 are thus available; namely, rating against per cent benzene in n-heptane for octane numbers between 100 and 117.6, and rating against TEL in iso-octane for octane numbers between 100 and 118.7. Conversion charts for both of these methods are shown in Table 3.

From the data secured by rating the various blends in the manner described the curve shown in Figure 2 was drawn. Since that time, this curve has been of great value as a guide to indicate the correct compression ratios in routine testing.

According to the data of Figure 1 the TEL susceptibility of the five stocks can be expressed as the ratio of the cc. of TEL in the primary reference fuel blend of the same octane number to equal the response in the test fuel. Thus the responsiveness of the five stocks shown in Figure 1 would be as follows:

	At cc. per gallon in test fuel			Best straight line
	1.0	2.0	3.0	
Cracked gasoline	0.20	0.175	0.15	0.16
C-10 reference fuel	0.40	0.375	0.40	0.39
Straightrun gasoline	0.55	0.475	0.43	0.47
12-lb. natural gasoline	0.70	0.65	0.60	0.63
Isopentane	1.25	1.175	....	1.18

TABLE 1—TEL CURVES FOR VARIOUS BLENDS OF ISOOCTANE WITH n-HEPTANE

(Averages of four tests each)

Per cent iso-octane in n-heptane	TEL content (cc.'s per gallon)							
	0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0
0	0.0	11.7	22.2	36.1	44.4	48.7	51.9	54.6
25	25.0	38.0	44.6	56.4	61.8	64.6	66.7	68.6
40	40.0	50.2	58.0	67.3	71.4	73.6	75.2	76.9
55	55.0	65.0	71.0	78.2	80.8	82.6	84.0	85.3
70	70.0	79.5	83.9	88.4	90.6	92.0	93.2	94.2
85	85.0	93.5	97.0	100.2	102.3	103.9	105.3	106.5
100	100.0	106.2	109.1	112.1	114.1	115.8	117.3	118.7

TABLE 2—OCTANE NUMBERS OF TEL CURVES FOR BLENDS OF ISO-OCTANE AND n-HEPTANE

Blend—	Octane Numbers for TEL Content of							
	0.0cc	0.5cc	1.0cc	2.0cc	3.0cc	4.0cc	5.0cc	6.0cc
n-Heptane	0.0	11.7	22.2	36.1	44.4	48.7	51.9	54.6
5% iso-octane + 95% n-heptane	5.0	15.6	26.7	40.1	47.9	51.9	54.9	57.4
10% iso-octane + 90% n-heptane	10.0	21.4	31.1	44.0	51.2	55.0	57.8	60.1
15% iso-octane + 85% n-heptane	15.0	26.3	35.6	48.0	54.7	58.2	60.8	63.0
20% iso-octane + 80% n-heptane	20.0	31.1	40.1	51.9	58.0	61.3	63.6	65.6
25% iso-octane + 75% n-heptane	25.0	36.0	44.6	56.0	61.6	64.6	66.7	68.6
30% iso-octane + 70% n-heptane	30.0	40.8	49.0	59.8	64.8	67.5	69.4	71.1
35% iso-octane + 65% n-heptane	35.0	45.6	53.4	63.6	68.1	70.5	72.3	73.9
40% iso-octane + 60% n-heptane	40.0	50.4	57.8	67.3	71.3	73.5	75.1	76.6
45% iso-octane + 55% n-heptane	45.0	55.2	62.2	71.0	74.5	76.5	78.0	79.4
50% iso-octane + 50% n-heptane	50.0	60.1	66.5	74.5	77.5	79.4	80.9	82.3
55% iso-octane + 45% n-heptane	55.0	65.0	70.9	78.1	80.7	82.5	84.0	85.4
60% iso-octane + 40% n-heptane	60.0	69.9	75.2	81.6	83.9	85.6	87.1	88.5
65% iso-octane + 35% n-heptane	65.0	74.7	79.6	85.2	87.3	89.0	90.5	91.9
70% iso-octane + 30% n-heptane	70.0	79.5	83.9	88.7	90.7	92.4	93.9	95.1
75% iso-octane + 25% n-heptane	75.0	84.2	88.2	92.3	94.3	96.0	97.5	98.9
80% iso-octane + 20% n-heptane	80.0	88.9	92.5	96.0	98.0	99.7	101.2	102.6
85% iso-octane + 15% n-heptane	85.0	93.5	96.8	100.0	102.0	103.7	105.2	106.6
90% iso-octane + 10% n-heptane	90.0	97.9	101.0	104.1	106.1	107.8	109.3	110.7
95% iso-octane + 5% n-heptane	95.0	102.1	105.1	108.1	110.1	111.8	113.3	114.7
iso-octane	100.0	106.2	109.1	112.1	114.1	115.8	117.3	118.7

TABLE 3—CONVERSION CHARTS

(a) TEL in Iso-Octane to Octane Number

TEL/gal.of Iso-octane,cc.	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.0	100.0	101.6	103.2	104.5	105.4	106.2	106.9	107.5	108.1	108.6
1.0	109.1	109.5	109.8	110.1	110.4	110.7	111.0	111.3	111.6	111.8
2.0	112.1	112.3	112.5	112.7	112.9	113.1	113.3	113.5	113.7	113.9
3.0	114.1	114.3	114.5	114.6	114.8	115.0	115.2	115.3	115.5	115.7
4.0	115.8	116.0	116.1	116.3	116.4	116.6	116.7	116.8	117.0	117.1
5.0	117.3	117.4	117.6	117.7	117.9	118.0	118.2	118.3	118.4	118.5
6.0	118.7	.....	.....	.....	.....	.....	.....	.....	.....	.....

(b) Benzene in n-Heptane to Octane Number

Per cent benzine in n-heptane	0.0	0.1	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
80.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	98.8
90.0	100.5	102.3	104.0	105.7	107.4	109.1	110.8	112.5	114.2	115.9
100.0	117.6	.....	.....	.....	.....	.....	.....	.....	.....	.....

Of the many gasolines tested in this laboratory the straightrun and natural gasolines are superior in TEL susceptibility. Isopentane is in a class by itself in manifesting a greater susceptibility than the corresponding primary reference fuel blend.

Another approach to a mathematical definition of TEL susceptibility (S) would be in accordance with the following formula:

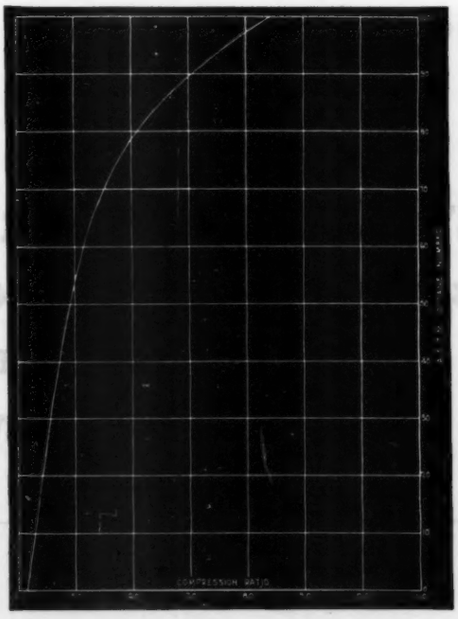


Fig. 2—Octane number compared with compression ratio for constant knock intensity

$$S = \frac{X}{Z}, \text{ where}$$

X = increase in octane number of test fuel for a given addition of TEL.

Z = increase in octane number of corresponding primary reference fuel blend for the same addition of TEL.

A study of the data of Table 2 shows that the value of S can be mathematically expressed by the general formula:

$$S = \frac{X}{a - by}, \text{ where}$$

y = octane number of test fuel unethylized.

The constants a and b have the following values in the range of 30 to 80 octane number for y:

cc. TEL added	a	b
0.5	11.7	0.0325
1.0	22.9	0.13
2.0	38.4	0.28
3.0	44.4	0.343

As a specific example of the application of the above definition, the susceptibility (S) of a 64 octane number gasoline which shows increases of 9, 13, 17, and 19 octane numbers with 0.5, 1.0, 2.0, and 3.0 cc. TEL is 0.937, 0.892, 0.828, and 0.847 respectively.

In general the slopes of the best straight lines as shown in Figure 1 seem to provide a more accurate definition of TEL susceptibility than the formula method since the graph will reveal peculiarities and abnormalities.

Acknowledgements

Messrs. R. R. Couch and E. F. Glasgow are entitled to a large measure of credit for the careful testing which formed the basis for the relationships described.

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Refining Capacity Increased to New High by Plant Additions

By D. H. STORMONT

The total crude capacity of refineries in the United States, and also the capacity of operating refineries, showed a substantial increase during 1937. That this growth in capacity was accomplished in spite of a decrease in the total number of refineries and in the number of operating plants, serves to point out the large amount of construction work undertaken by refining companies during the past year. Comparatively few new plants were added to the list so that the larger part of the increase in capacity resulted from enlargement of existing refining facilities.

There were 451 operating refineries and 111 shutdown plants in the United States on March 1, 1938; representing a decrease of 20 in the number of operating refineries and a decline of 21 in the number of shutdown plants as compared with the totals of a year ago. Thus the total number of plants is now at the lowest point of any time since 1932, or before the East Texas refining boom caused the number of plants to skyrocket. And, since practically all of this year's decline in plants was due to dismantling of skimming plants in the East Texas field, the list of plants may be said to be back to its original status. Only some six or eight plants are now operating in this field out of the eighty-odd plants constructed there.

Shutdown Capacity Decreased

The total refining capacity of the 562 plants was 4,511,160 bbls., some 234,000 bbls. higher than on March 1, 1937, and the highest in the industry's history. Of this total, 4,301,910 bbls. capacity was in operation and 209,250 bbls. shut down, as compared with 4,038,010 bbls. active capacity and 239,850 bbls. shutdown capacity in 1937. Thus it is seen that while the active capacity registered a substantial gain, the shutdown capacity decreased by some 30,000 bbls.

The active capacity of Texas, the leading state, showed a gain of over 110,000 bbls., but the shutdown capacity declined some 22,000 bbls. so that its net gain was about 90,000 bbls. The greater part of the new capacity was the result of enlargements in Gulf Coast refineries, since additions to capacity and new plants built in the interior would hardly more than offset the capacity of plants dismantled in East Texas and other districts. Practically all the Gulf Coast refineries were the scenes of enlargement work at some time or other during 1937 as new equipment, largely combination units, was added to replace obsolete units or as new capacity. The combined capacity of seven Gulf refineries now total over 690,000 bbls., one-half the capacity of Texas and more than twice that of any state except California.

The number of operating plants in Texas on March 1, 1938, was 112, or some 18 less than in the previous March, and the number of shutdown refineries declined from 60 to 43. As stated, the decline was due mostly to dismantling of East Texas refineries.

California likewise recorded a large gain in capacity, comparable figures for 1937 and 1938 being 878,310 bbls. and 971,060 bbls. with the shutdown capacity remaining relatively unchanged. The total number of refineries was the same on the two dates, 83, but the number of operating plants increased by four to 67. As in Texas the greater part of the new capacity was the result of plant enlargement work rather than the construction of any new refineries. A few new refineries were built during 1937, but such new capacity was offset by plant abandonments.

Although total capacity for the state has reached only some 71,400 bbls., Michigan registered the greatest relative gain during the year in the number of plants. There are now 26 refineries in that district, as compared with 19 refineries having a capacity of 49,520 bbls. in March, 1937.

Both Oklahoma and Pennsylvania showed decreases in the total number of plants, and Oklahoma in total and active capacity. Pennsylvania, however, registered a slight gain in total and operating capacity, due entirely to plant enlargement work. Illinois and Indiana made slight gains in refining capacity but the number of plants remained unchanged. In Louisiana the number of refineries decreased from 16 to 15 but the total refining capacity showed a small increase.

Several refineries carried as shutdown in the survey, especially in Texas, are obsolete and probably will never be reopened. Thus the total refining capacity shown is probably somewhat high. The total of such plants, however, is relatively small, and as they are dropped from the list this loss in capacity will be offset by new construction. The total active refining capacity shown, 4,301,910 bbls. daily, is also somewhat high, since this figure includes shell-still capacity and some obsolete equipment.

In 1937 the peak daily throughput was approximately 3,500,000 bbls. daily, at which time practically all the large refineries were operating at capacity levels. Thus the active capacity that can be economically operated is probably considerably under that shown. This is further borne out by the fact that the gasoline recovery during 1937 was the same as that in 1936, despite all the hundred thousands of barrels of new highly efficient equipment placed in operation since 1936.

Cracking Capacity Higher

Construction of new cracking units during the past year, mostly in the form of large combination units, was much greater than in 1936 and as a result the total for the United States increased some 155,000 bbls. to an all-time high of 2,327,215 bbls. The Gulf Coast advanced to first place in the amount of cracking capacity, displacing the East Coast.

During 1936 the total output of cracked gasoline in the United States surpassed that of straightrun gasoline for the first time, and in 1937 the proportion of cracked gasoline was even higher. According to preliminary Bureau of Mines figures, production of cracked gasoline in 1937 totaled 268,136,000 bbls. as compared with 251,507,000 bbls. of straightrun gasoline. In 1936 the comparative figures were 239,650,000 bbls. and 231,344,000 bbls. Thus while the output of cracked gasoline was increased by 12 per cent, the total cracking capacity was raised by only 7 per cent.

A few small refineries were added in Canada during the year so that its total and operating capacity showed a slight increase. In Mexico the number of plants and capacity remained unchanged.

Growth of Refinery Capacity in United States

Year—	Number of refineries	Total crude capacity (bbls. daily)	Number of operating refineries	Capacity of operating refineries (bbls. daily)	Total cracking capacity (bbls. daily)
1914	176	.....	...	.....	.....
1918	267	1,186,155	...	.....	.....
1919	289	1,295,115	...	.....	.....
1920	373	1,530,565	...	.....	.....
1921	415	1,888,800	...	.....	.....
1922	479	2,164,050	325	1,854,590	.....
1924	574	3,046,790	362	2,549,490	.....
1925	584	3,033,682	385	2,680,052	(*)
1926	515	3,068,340	356	2,770,340	980,960
1927	462	3,224,307	328	2,964,427	1,245,980
1928	456	3,426,330	315	3,116,930	1,327,584
1929	463	3,719,550	341	3,454,250	1,487,950
1930	479	3,972,460	362	3,721,360	1,705,299
1931	500	4,164,080	397	3,913,180	1,844,609
1932	510	4,093,370	383	3,665,830	1,954,550
1933	567	4,125,250	424	3,696,410	1,823,521
1934	628	4,243,033	483	3,790,593	1,838,420
1935	687	4,281,694	496	3,815,470	2,126,620
1936	640	4,301,754	479	3,936,535	2,130,800
1937	603	4,277,860	471	4,038,010	2,172,330
1938	562	4,511,160	451	4,301,910	2,327,215

*Not available previous to 1926.

Personnel of United States Refineries

ABBREVIATIONS USED

Chm. Bd.—Chairman of Board
Pres.—President
V. P.—Vice President
Sec.—Secretary
Treas.—Treasurer
Gen. Mgr.—General Manager
Gen. Supt.—General Superintendent
Sales Mgr.—Sales Manager
Tankcar S. M.—Tankcar Sales Manager
Station S. M.—Station Sales Manager
Pur. Agt.—Purchasing Agent
Traf. Mgr.—Traffic Manager
Ch. Engr.—Chief Engineer
Supt.—Superintendent
Asst. Supt.—Assistant Superintendent
Ch. Chem.—Chief Chemist

A

Aerex Co., The, Bloomfield, N. Mex.
Pres., and *Gen. Mgr.,* A. C. Kittell. *V. P.,* V. A. Kittell. *Sec.* and *Gen. Supt. Ref.,* G. D. Noland. *Refinery* located at Bloomfield, N. Mex.

Aero Gas Refining Co., Fort Stockton, Tex.
Gen. Mgr., J. C. Williams. *Refinery* located at Fort Stockton, Tex.

Aetna Oil Service, Inc., 1202 S. Third St., Louisville, Ky.
Pres. and *Treas.,* W. R. Abbott. *V. P.* and *Sec.,* W. T. Davis. *Tankcar S. M.,* H. J. Flanders. *Ser. Sta. S. M.,* Julius Malkemus. *Ch. Engr.,* Dr. C. M. Alexander. *Ch. Chem.,* Walter Norman. *Pur. Agt.,* E. C. Wolff. *Traf. Mgr.,* H. J. Flanders. *Supt.,* E. E. Van Buren. *Refinery* located at Louisville, Ky.

Airline Petroleum Corp., San Francisco, Calif.
Pres., Mrs. Fred T. Murphy. *V. P.,* John H. Bailey, Bakersfield, Calif. *Sec.* and *Treas.,* A. Senderman. *Gen. Mgr.,* J. H. Fuller. *Refinery* located at Oildale, Calif.

Allegany Refiners, Inc., Genessee Road, Bolivar, N. Y.
Pres., A. L. Shaner. *V. P.'s,* C. A. Chipman; D. V. McCarthy. *Sec.,* C. A. Chipman. *Treas.,* W. E. Hammond. *Asst. Sec.,* H. L. Chambers. *Asst. Treas.,* H. J. Arnold. *Gen. Supt. Ref.,* A. K. Wickham. *Sales Mgr.,* H. L. Chambers. *Ch. Chem.,* H. O. Button. *Pur. Agt.,* H. J. Arnold. *Refinery* located at Bolivar, N. Y.

Allstate Refining Co., Box 270, Tyler, Tex.
Pres., H. H. Coffield. *V. P.* and *Gen. Supt. Ref.,* George P. Mann. *Sec.* and *Treas.,* J. H. Edwards. *Refinery* located at Thrall, Tex.

Alpine Refining Corp., 7200 Manchester, Houston, Tex.
Pres., A. E. Richel. *Sec.* and *Treas.,* Roy F. Stewart. *Supt.,* B. E. Carter. *Refinery* located at Houston, Tex.

Alto Refining Co., Corpus Christi, Tex.
Partnership, J. E. Connor and W. L. Goodson. *Refinery* located at Clarkwood, Tex.

American Petroleum Co. of Texas, Petroleum Bldg., Houston, Tex.
Pres., G. O. Irvine. *V. P.,* T. J. Arnold. *Sec.,* G. L. Townsan. *Treas.,* C. T. Carnes. *Mgr. of Oper.,* J. B. Joyce. *Ref. Supt.,* S. J. Bell. *Tankcar* and *Service Sta. S. M.,* J. M. Cook. *Ch. Engr.,* John H. Bringhurst. *Ch. Chem.,* H. P. Sellers. *Pur. Agt.,* W. G. Freitag. *Traf. Mgr.,* J. E. Considine. *Refinery* located at Norsworthy Terminal, Houston, Tex.

Amaco Refining Co., Box 1607, Corpus Christi, Tex.
Pres., Kent W. Bartlett. *V. P.'s,* John D. Manley; Ward C. Pearl; John A. Bartlett. *Sec.,* Harold Pearson. *Treas.,* F. R. Lowrey. *Gen. Supt. Ref.,* Fred Geiger. *Refineries* located at Mirando City, Tex.; Corpus Christi, Tex.

Anderson-Prichard Refining Corp., 1000 Ramsey Tower, Oklahoma City, Okla.
Pres. and *Gen. Mgr.,* L. H. Prichard. *V. P.,* J. Steve Anderson. *Sec.* and *Treas.,* P. H. Anderson. *Mgr. of Ref.,* George H. Burrus. *Dir. in Chg. Refined Oil Sales,* C. L. Mayhall. *Dir. in Chg. Industrial Sales,* C. H. Dresser. *Pur. Agt.,* W. M. Sturges. *Traf. Mgr.,* M. H. Champion. *Refinery* located at Cyril, Okla.

Arkansas Fuel Oil Co., Box 1734, Shreveport, La.
V. P.'s, D. W. Harris; F. R. Coates; A. F. Holliday; J. R. Munce. *Sec.,* T. J. Heard. *Treas.,* B. R. Muirhead. *Gen. Mgr.,* D. W. Harris. *Gen. Supt. Ref.,* R. B. Pierce. *Sales Mgr.,* J. A. Welch. *Ch. Engr.,* H. T. Goss. *Ch. Chem.,* A. W. Trusty. *Pur. Agt.,* J. Lucas. *Traf. Mgr.,* E. M. Hinkle. *Asst. Supt.,* G. W. Wilbur, Bossier City, La. *Refinery* located at Bossier City, La.

Aromalene, Inc., 1840 E. Twenty-ninth St., Long Beach, Calif.
Pres. and *Gen. Supt. Ref.,* J. L. Bensinger. *V. P.* and *Ch. Engr.,* M. C. Valdes. *Sec.* and *Treas.,* Victor W. Posta. *Pur. Agt.,* Gordon Weeden. *Refinery* located at Signal Hill, Calif.

Arro Oil & Refining Co., 605 Montana Bldg., Lewistown, Mont.
Pres., H. H. Schwartz. *V. P., Treas.* and *Gen. Mgr.,* Ed L. Allen. *Sec.,* Guy R. Enlow. *Gen. Supt. Ref.,* Paul Jones. *Tankcar S. M.,* T. R. Gilmour. *Ch. Chem.,* Paul Cooper. *Asst. Supt.,* Charles Cox. *Refinery* located at Lewistown, Mont.

Ashland Oil & Refining Co., Ashland, Ky.
Pres., Paul G. Blazer. *V. P.,* W. H. Keffer. *Sec.,* E. L. McDonald. *Treas.,* E. W. Seaton. *Gen. Supt. Ref.,* F. W. Irwin. *Tankcar S. M.,* E. F. Wells. *Service Sta. S. M.,* A. A. Hines. *Ch. Engr.,* F. Leo Bever. *Ch. Chem.,* John S. Pfarr. *Pur. Agt.,* M. K. Lovell. *Traf. Mgr.,* P. H. Banks. *Trans. Mgr.,* M. C. Dupree. *Refinery* located at Catlettsburg, Ky. (Refinery of Tri-State Refining Co., an affiliated company, located at Kenova, W. Va.)

Atlantic-Pacific & Gulf Refining Co., Box 423, Wichita Falls, Tex.
Pres., J. P. Howe. *V. P.,* C. E. Howe. *Sec.* and *Treas.,* G. W. Byrd. *Gen. Mgr.,* W. F. de Haas. *Refinery* located at Wichita Falls, Tex.

Atlantic Refining Co., The, 260 S. Broad St., Philadelphia, Pa.
Chm. Bd., J. W. Van Dyke. *Pres.,* Robert H. Colley. *V. P.'s,* W. D. Anderson; W. M. O'Connor; E. J. Henry; E. H. Blum; W. C. Yeager; A. A. Garrabrant; R. C. Tuttle. *Sec.,* W. M. O'Connor. *Treas.,* Paul Shuman. *Gen. Mgr. Ref.,* E. J. Henry. *Sales Mgr., Domestic,* W. C. Yeager. *Sales Mgr., Export,* W. D. Anderson. *Ch. Engr.,* L. M. Goldsmith. *Ch. Chem.,* H. M. Hancock. *Pur. Agt.,* J. S. Parks. *Mgr.*

REFINERY OPERATIONS IN NORTH AMERICA SEGREGATED ACCORDING TO PLANT LOCATION

State—	No. of plants	Daily crude capacity (bbls.)	Daily cracking capacity (bbls.)	No. of plants operating	Crude capacity operating plants	No. of plants shut down	Crude capacity plants shut down
UNITED STATES							
Alabama	1	4,000	.....	1	4,000	...	.....
Arkansas	7	43,750	13,000	6	38,250	1	5,500
California	83	971,060	430,450	67	939,710	16	31,350
Colorado	11	10,720	3,400	8	9,440	3	1,280
Delaware	1	3,500	.....	1	3,500	...	.....
Georgia	1	4,000	.....	1	4,000	...	.....
Illinois	12	144,400	92,350	11	142,400	1	2,000
Indiana	6	216,250	163,900	6	216,250	...	.....
Kansas	26	185,795	99,600	22	180,450	4	5,345
Kentucky	10	29,950	15,400	7	25,600	3	4,350
Louisiana	15	204,500	89,700	14	199,500	1	5,000
Maryland	3	43,500	51,500	3	43,500	...	.....
Massachusetts	2	74,000	27,000	2	74,000	...	.....
Michigan	26	71,400	12,325	23	65,900	3	5,500
Missouri	2	24,200	18,000	2	24,200	...	.....
Montana	28	32,790	10,050	20	29,015	8	3,775
Nebraska	5	1,325	.....	4	1,250	1	75
New Jersey	9	248,500	200,100	9	248,500	...	.....
New Mexico	9	8,575	2,640	9	8,575	...	.....
New York	7	61,500	11,200	7	61,500	...	.....
Ohio	16	129,690	82,000	13	129,100	3	590
Oklahoma	39	252,390	111,000	28	215,690	11	36,700
Pennsylvania	37	323,100	170,350	34	307,100	3	16,000
Rhode Island	2	11,000	1,650	2	11,000	...	.....
South Carolina	1	5,000	.....	1	5,000	...	.....
South Dakota	3	410	.....	3	410	...	.....
Tennessee	1	200	.....	1	200	...	.....
Texas	155	1,326,865	678,000	112	1,241,150	43	85,715
Utah	4	8,300	8,000	2	8,000	2	300
Virginia	1	2,000	.....	1	2,000	...	.....
West Virginia	5	13,000	6,700	4	10,500	1	2,500
Wyoming	34	55,490	28,400	27	52,220	7	3,270
Total	562	4,511,160	2,327,215	451	4,301,910	111	209,250
CANADA							
Alberta	7	11,000	5,600	6	8,500	1	2,500
British Columbia	4	23,500	6,800	4	23,500	...	.....
Manitoba	2	2,200	.....	2	2,200	...	.....
Nova Scotia	1	17,000	8,300	1	17,000	...	.....
Ontario	6	38,100	23,300	4	32,500	2	5,600
Quebec	5	78,700	36,100	5	78,700	...	.....
Saskatchewan	14	12,400	6,200	13	12,250	1	150
Total	39	182,900	86,300	35	174,650	4	8,250
MEXICO							
Total Mexico	5	134,000	12,900	5	134,000	...	.....

Trans., R. C. Tuttle. *Ref. Mgrs.*, H. M. Nichols; M. J. Welsh, Atreco, Tex. *Asst. Ref. Mgrs.*, W. F. Stroud, Jr.; Robert Stewart, Atreco, Tex.; *Refineries* located at Philadelphia, Pa.; Atreco, Tex.

Atlas Pipe Line Corp., P. O. Box 1607, Shreveport, La.

Pres., E. R. Ratcliff. *V. P.*, B. H. Gray. *Sec.* and *Treas.*, B. F. Connolly. *Gen. Supt. Ref.*, D. H. Christman. *Tankcar S. M.*, Pleas O. Hardwick. *Ser. Sta. S. M.*, W. S. Gray. *Ch. Engr.*, E. A. Meagher. *Ch. Chem.*, I. D. Rushing. *Pur. Agt.*, R. W. Nix. *Traf. Mgr.*, J. S. Satterley. *Supt.*, D. H. Christman. *Asst. Supt.*, C. P. Christman. *Refinery* located at (Jewella), Shreveport, La.

Aurora Gasoline Co., 15911 Wyoming Ave., Detroit, Mich.

Pres., William E. Slaughter, Jr. *V. P.*, H. E. Wenger. *Sec.* and *Sales Mgr.*, Max M. Fisher. *Treas.*, C. S. Wenger. *Pur. Agt.*, W. E. Slaughter. *Supt.*, Larry Curran, Elsie, Mich. *Refineries* located at Elsie, Mich.; Detroit, Mich.

B

Bachmann Petroleum Corp., 1841 E. Twenty-ninth St., Long Beach, Calif.

Pres., E. O. Bachmann. *V. P.*, D. S. Jeppson. *Sec.* and *Treas.*, John G. Bachmann. *Gen. Supt. Ref.*, Charles S. Cox. *Station S. M.*, A. R. McIntosh. *Refinery* located at Long Beach, Calif.

Bair, F. M., Oil Co., P. O. Box 666, Grand Ledge, Mich.

Pres. and *Gen. Mgr.*, F. M. Bair. *V. P.*, H. H. Wilton. *Sec.* and *Treas.*, Blanche Bair. *Refinery* located at Grand Ledge, Mich.

Baird Refining Co., Baird, Tex.

Pres., M. G. Bialock. *Sec.*, R. P. Hargis. *Treas.*, Dallas C. Biggers. *Gen. Mgr.*, Sylvester Dayson. *Station S. M.*, E. L. Woodley. *Ch. Engr.*, L. G. Dufilho. *Pur. Agt.*, J. E. Bullock. *Supt.*, J. B. Misenheimer. *Refinery* located at Baird, Tex.

Barber Co., The, Inc., 1600 Arch St., Philadelphia, Pa.

Pres., J. E. Auten. *V. P.*, Frank Seamans. *Sec.*, E. R. Riter. *Treas.*, F. J. Robertson. *Prod. Engr.*, J. L. O'Neill, Barber, N. J. *Gen. Supt. Ref.*, Joseph Slutzker. *Tankcar S. M.*, H. C. Hottel. *Ch. Engr.*, Charles T. McGrady, Barber, N. J. *Dir. Tech. Bureau*, J. S. Miller, Barber, N. J. *Pur. Agt.*, R. A. Brady. *Supt.*, H. J. Fleischer, Barber, N. J. *Refinery* located at Barber, N. J.

Barnsdall Refining Corp., P. O. Box 2009, Tulsa, Okla.

Pres., E. B. Reeser. *V. P.'s*, F. E. Holsten; G. F. Racette; L. A. Potter. *Sec.*, E. R. Atwill, Jr. *Treas.*, C. E. Votrian. *Gen. Mgr.*, F. E. Holsten. *Gen. Supt. Ref.*, F. E. Holsten. *Sales Mgr.*, G. F. Racette. *Ch. Engrs.*, J. M. McMillen; M. L. Cooper. *Ch. Chems.*, A. B. Comstock; G. S. Mitchell; R. E. Puckett. *Pur. Agt.*, O. E. McClatchey. *Traf. Mgr.*, R. E. Stewart. *Supts.*, F. S. Horne, Barnsdall, Okla.; V. R. Oakley, Wichita, Kans.; G. T. Granger, Corpus Christi, Tex. *Asst. Supt.*, E. R. Wiles, Barnsdall, Okla. *Refineries* located at Barnsdall and Okmulgee, Okla.; Wichita, Kans.; Corpus Christi, Tex.

Basin Refining Co., Box 96, Aztec, N. Mex.

Owner, D. J. Lingenfelter. *Supt.*, Chas. Riecke. *Refinery* located at Aztec, N. Mex.

Bay Petroleum Corp., The, Denver, Colo.

Pres. and *Gen. Mgr.*, M. H. Robineau. *V. P.*, R. V. Rodman. *Sec.* and *Treas.*, H. E. Armitage. *Gen. Supt. Ref.*, *Ch. Engr.* and *Pur. Agt.*, W. R. Newman. *Ref. Mgrs.*, L. L. Leabo, Cheyenne, Wyo. and Denver Refineries; M. C. Bradshaw, McPherson, Kans. *Traf. Mgr.*, W. F. Telken. *Supts.*, J. B. Brooks, Cheyenne, Wyo.; Carl Orrison, Denver, Colo.; Claude Withers, McPherson, Kans. *Refineries* located at Cheyenne, Wyo.; Denver, Colo.; McPherson, Kans.

Bay Refining Corp., Bearinger Bldg., Saginaw, Mich.

Pres., James C. Graves. *V. P.*, Howard D. Atha. *Sec.* and *Treas.*, T. A. Galey. *Gen. Mgr.*, Edward Reiser. *Tankcar S. M.*, Kenneth Patterson. *Traf. Mgr.*, Allan R. Laverty. *Refinery* located at Bay City, Mich.

Bayou State Oil Corp., 728 Ardis Bldg., Shreveport, La.

Pres. and *Gen. Mgr.*, P. M. Brown. *V. P.*, S. M. Cook. *Sec.* and *Treas.*, F. M. Cook. *Gen. Supt. Ref.*, T. N. Reed. *Tankcar S. M.*, W. T. Leeper. *Ch. Engr.*, T. N. Reed. *Ch. Chem.*, H. J. Sheard. *Pur. Agt.*, F. D. Coons. *Refinery* located at Hosston, La.

Beacon Oil & Refining Co., Henderson, Tex.

Pres., Treas and *Gen. Mgr.*, T. P. Cannon. *V. P.*, Mrs. Alice M. Roberts. *Sec.*, T. A. Garnett. *Gen. Supt. Ref.*, L. H. Barbee. *Ser. Sta. S. M.*, Bob McWilliams. *Refinery* located at Henderson, Tex.

Beck, G. T., Refinery, Box 528, Cody, Wyo.

Owner, G. T. Beck. *Gen. Mgr.*, G. T. Beck, Jr. *Asst. Supt.*, C. M. Harland. *Refinery* located at Cody, Wyo.

Bell Oil & Gas Co., P. O. Box 2007, Tulsa, Okla.

Pres., Samuel L. Lubell. *V. P.'s*, Albert Finston; M. Lloyd Freese; I. Arthur Anson. *Sec.* and *Treas.*, Benedict I. Lubell. *Gen. Mgr.*, Albert Finston. *Gen.*

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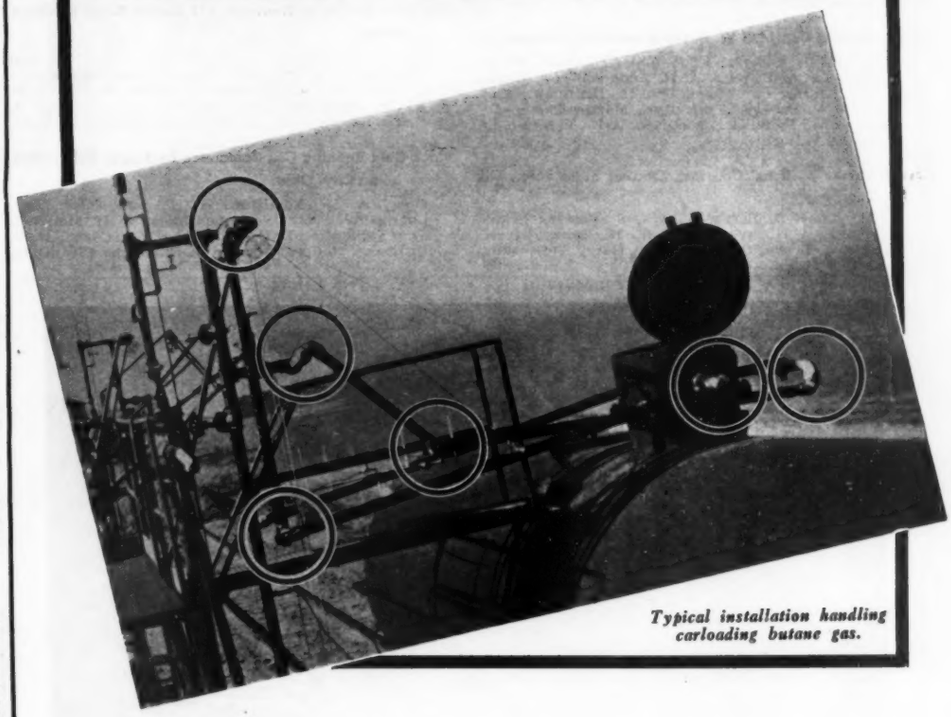
HOLD BUTANE!



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For over four years Chiksan Ball Bearing Swing Joints have been successfully used in refineries to hold Butane—a definite proof of the sound design of the Chiksan Swing Joint!

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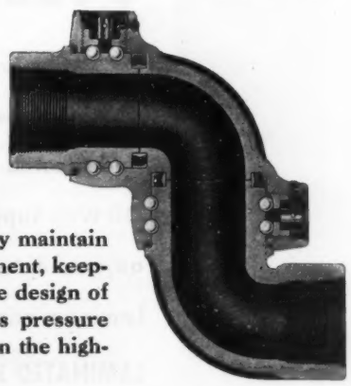

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The secret of the outstanding efficiency of Chiksan Joints lies in their scientific design. Double rows of hardened steel balls perform two functions—first, they carry all radial loads and maintain the joint in perfect alignment under all conditions; and second, they maintain a preregulated thrust load upon the packing element, keeping it always pressure-tight and leak-proof. The design of the packing unit causes it to expand tighter as pressure increases, and the joint will not bind under even the highest pressures.

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CHIKSAN OIL TOOL CO. LIMITED

FULLERTON, CALIFORNIA • SHELL BLDG., HOUSTON, TEXAS
GULF ENGINEERS • HOUSTON, TEXAS

Supt. Ref., Rex Young. *Tankcar S. M.*, M. L. Freese. *Ser. Sta. S. M.*, L. H. Deatherage. *Ch. Chem.*, Grant Jarrell. *Pur. Agt.*, Jerome H. Naron. *Traf. Mgr.*, Chester E. Cadieux. *Supt.*, Rex Young. Grandfield, Okla. *Refinery* located at Grandfield, Okla.

Benavides Refining Co., Benavides, Tex.

Pres., C. L. McIver, Kilgore, Tex. *V. P.*, B. McCullum. *Sec.* and *Treas.*, Joe Presnall, Jr. *Refinery* located at Benavides, Tex.

Berry Asphalt Co., 1472 W. Seventy-sixth St., Chicago, Ill.

Pres., B. H. Roberts. *V. P.* and *Gen. Mgr.*, H. B. Pullar. *Sec.* and *Treas.*, A. H. Anderson. *Ch. Engr.*, J. W. Smith. *Ch. Chem.*, W. H. Huffman. *Pur. Agt.*, J. W. Savage. *Traf. Mgr.*, Martin Thompson. *Supt.*, A. T. Van Pelt., Waterloo, Ark. *Refinery* located at Waterloo, Ark.

Berry, James B., Sons' Co., Inc., Quaker State Bldg., Oil City, Pa.

Pres., James D. Berry. *V. P.'s*, S. Messer.; Frank Berry; E. L. Cleaves. *Sec.*, W. R. Reitz. *Treas.* Charles D. Berry. *Gen. Supt. Ref.*, Harry Shoemaker. *Tankcar S. M.*, Frank Berry. *Ch. Chem.*, Russell Buckham. *Pur. Agt.*, Lee R. Forker. *Traf. Mgr.*, George W. Ebert. *Asst. Supt.*, Paul Biery. *Refinery* located at Oil City, Pa.

Berthoud Refinery, P. O. Box 336, Berthoud, Colo.

Owners and partners, W. J. Cole and D. J. Lingenfelter. *Refinery* located at Berthoud, Colo.

Big West Oil Co. of Montana, 617 Hutton Bldg., Spokane, Wash.

Pres., L. R. Hawley. *V. P.*, Charles P. Lund. *Sec.* and *Treas.*, John E. Orr. *Sales Mgr.*, R. I. Kerr. *Ch. Engr.*, L. J. Williams, Kevin, Mont. *Ch. Chem.*, D. J. Mullady, Kevin, Mont. *Pur. Agt.* and *Gen. Supt.*, George A. Engle, Kevin, Mont. *Refinery* located at Kevin, Mont.

Black Gold Refining Co., Commerce Exchange Bldg., Oklahoma City, Okla.

Pres., A. M. Edmiston. *V. P.* and *Sales Mgr.*, Charles W. Scott. *Sec.* and *Treas.*, C. H. Marshall. *Gen. Supt. Ref.*, E. C. Livingston. *Ch. Chem.*, H. P. Fishburn. *Refinery* located at Oklahoma City, Okla.

Bradford Oil Refining Co., Box 197, Bradford, Pa.

Pres. and *Gen. Mgr.*, E. R. Bederer. *V. P.*, F. D. Korner. *Sec.* and *Treas.*, H. G. Bancroft. *Gen. Supt. Ref.*, C. A. Barrere. *Tankcar S. M.*, J. G. Fleischman. *Ch. Chem.*, Max Giesler, Ph. D. *Pur. Agt.*, H. B. Newbern. *Traf. Mgr.*, W. F. Jewell. *Asst. Supt.*, Raymond Bridiere. *Refinery* located at Bradford, Pa.

Bradford Penn Refining Corp., Brown Ave., Clarendon, Pa.

Pres., Forest Dorn. *V. P.'s*, A. D. David; W. Frank Miller. *Treas.*, R. J. Brennan. *Gen. Mgr.*, A. D. David. *Tankcar S. M.*, J. F. Baldwin. *Station S. M.*, E. E. Hawley. *Ch. Chem.*, W. A. Johnston. *Pur. Agt.*, S. L. Meyers. *Supt.*, V. C. Burkhardt. *Asst. Supt.* Kenneth Nielson. *Refinery* located at Clarendon, Pa.

Bridger Refinery, Box 154, Bridger, Mont.

Owner, Hershal F. Best. *Refinery* located at Bridger, Mont.

Bush, R. R., Oil Co., 2790 Cherry Ave., Long Beach, Calif.

Pres., R. R. Bush. *V. P.* and *Gen. Mgr.*, W. H. Morgan. *Sec.* and *Treas.*, Neil Ensch. *Gen. Supt. Ref.*, W. E. Snowden. *Chem. Chem.*, Philip Bessor. *Pur. Agt.*, G. N. Crowther. *Asst. Supt.*, Raymond Rubbottom. *Refinery* located at Long Beach, Calif.

C

C. & H. Refinery, Lusk, Wyo.

James Hoblit and Roy Chamberiain, *partners*. *Refinery* located at Lusk, Wyo.

Calumet Refining Co., 4323 S. Western Blvd., Chicago, Ill.

Pres., P. B. Flynn. *V. P.* and *Gen. Mgr.*, T. A. Telfer. *Sec.* and *Treas.*, R. S. Watt. *Gen. Supt. Ref.*, Carl Harris. *Ch. Chem.*, M. B. Jester. *Refinery* located at Burnham, Ill.

Caminol Co., Ltd., The, 112 E. Ninth St., Los Angeles, Calif.

Pres., C. B. Colby. *V. P.* and *Gen. Mgr.*, R. E. Hines. *Sec.*, W. B. Allen. *Asst. Treas.*, Haney Craven. *Gen. Supt. Ref.*, R. C. Colvin. *Sales Mgr.*, Clifford Hancock. *Ch. Chem.*, Syd Garrett. *Pur. Agt.*, Robert McCammett. *Supts.*, Robert V. Monsen, Hanford, Calif.; Martin V. Mueller, Santa Fe Springs, Calif. *Refineries* located at Hanford, Calif.; Santa Fe Springs, Calif.

Canfield Oil Co., The, 3216 E. Fifty-fifth St., Cleveland, Ohio.

Pres., J. A. Jackson. *V. P.*, H. M. Carruth. *Sec.*, J. R. Nelson. *Treas.*, A. L. Bailey. *Gen. Supts. Ref.*, R. W. Helm, Coraopolis, Pa.; S. L. Milliff, Cleveland, Ohio. *Tankcar S. M.*, J. R. Nelson. *Service Station S. M.*, A. C. Ellinger. *Ch. Engr.*, L. W. Hodous. *Pur. Agt.*, M. C. Dippel. *Traf. Mgr.*, J. T. Mullaney. *Refineries* located at Coraopolis, Pa.; Cleveland, Ohio.

Canton Refining Co., The, Gambrinus Road, Canton, Ohio.

Pres. and *Treas.*, W. E. Weidler. *V. P.*, R. L. Blazer. *Sec.*, M. R. Wiseman. *Gen. Supt. Ref.*, C. L. Wedell. *Refinery* located at Canton, Ohio. (Note. The above company took over the operations of the Alco Refining Co., Canton, Ohio.)

Capitol Crude Oil Co. of Los Angeles, 1020 Subway Terminal Bldg., Los Angeles, Calif.

Pres., E. P. Clark. *Sec.*, A. E. Smith. *Refinery* located at Santa Paula, Calif.

Carbide & Carbon Chemicals Corp., 30 E. Forty-second St., New York, N. Y.

Pres., J. A. Rafferty. *V. P.'s*, G. O. Curme, Jr.; J. G. Davidson; J. W. McLaughlin; H. E. Thompson; R. W. White. *Sec.*, A. C. Cornell. *Treas.*, C. T. Ayres. *Works Mgr.*, G. B. Landes. *Gen. Supt. Ref.*, C. S. Heath, South Charleston, W. Va. *Sales Mgr.*, W. F. Reich. Jr. *Refinery* located at South Charleston, W. Va.

Carle Refining Co., 649 Soledad St., San Antonio, Tex.

Pres., L. M. Carle. *V. P.*, J. T. Mooney. *Sec.* and *Treas.*, Mrs. O. M. Carle. *Gen. Supt. Ref.*, A. J. Cryer. *Refinery* located at San Antonio, Tex.

Carpenter, Terry, Scotts Bluff, Neb.

Owner, Terry Carpenter. *Gen. Supt. Ref.*, Charles Glasby. *Tankcar S. M.*, Don Hillerege. *Refinery* located at Scotts Bluff, Neb.

Carroll, L. Ray, Roundup, Mont.

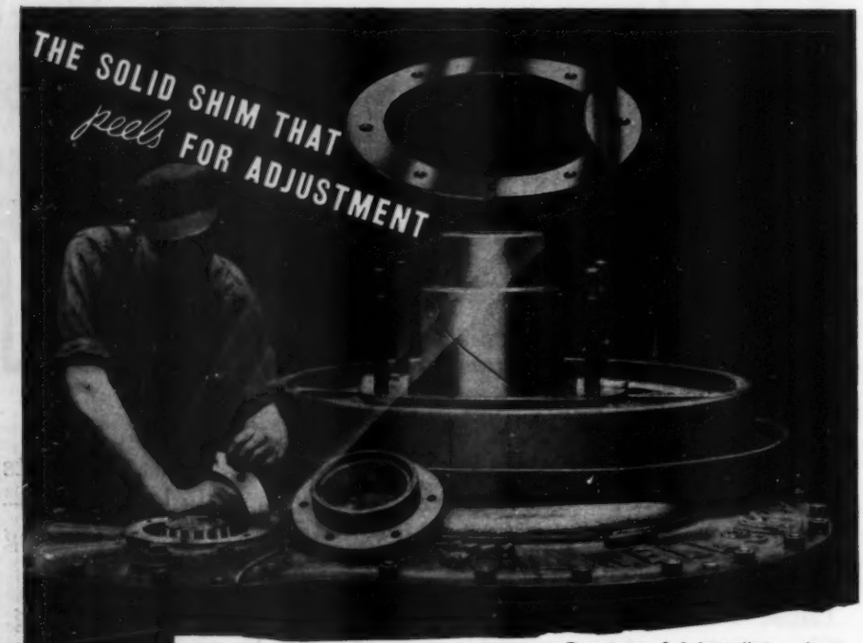
Owner, L. Ray Carroll. *Sec.* and *Treas.*, H. J. Carroll. *Gen. Mgr.*, H. Miner Lewis. *Refineries* located at Roundup, Mont.

Carson, M. D., Refining Co., Brady, Tex.

Owner, M. D. Carson. *Refinery* located at Brady, Tex.

Cascade Refining Co., P. O. Box 606, Kilgore, Tex.

Gen. Mgr., Julian Potter. *Gen. Supt. Ref.*, J. O. Johnston. *Tankcar S. M.*, S. M. Kennedy. *Ch. Chem.*, H. C. Blizzard. *Pur. Agt.*, Julian Potter. *Refinery* located at Reeds Switch, Tex.



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Pres., B. C. McClellan. *Exec. V. P.*, D. B. Williams. *V. P.'s*, Charles Leftwich; Carmelo D'Antoni. *Sec.* and *Treas.*, R. P. Batson. *Gen. Mgr.*, D. B. Williams. *Gen. Supt. Ref.*, J. C. Senter. *Tankcar S. M.*, H. G. Williams. *Ch. Chem*, Leo P McGurnin *Pur. Agt.*, V. G. McPherson. *Traf. Mgr.*, J. E. Loper. *Asst. Supt.*, H. H. Long. *Refinery* located at Chalmette, La.

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Chanute Refining Co., The, Box 431, Chanute, Kans.
Pres. and *Gen. Supt. Ref.*, R. W. Lind. *V. P.*, Elmer E. Conklin. *Asst. Sec.* and *Asst. Treas.*, Ray M. Coder. *Ch. Chem.*, J. M. Caldwell. *Pur. Agt.*, Elmer M. Cooper. *Asst. Supt.*, Roscoe Young. *Refinery* located at Chanute, Kans.

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Citizens Oil & Refining Corp., Luling, Tex.
Gen. Mgr., R. E. Goode. *Refinery* located at Luling, Tex.

Clay Refining Co., Arp, Tex.
Pres., Dick Duncan. *V. P.*, C. W. Curtis. *Sales Mgr.*, R. T. Bowen. *Refinery* located at Arp, Tex.

Coastal Petroleum Corp., P. O. Box 1546, Mobile, Ala.
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Coastal Refineries, Inc., P. O. Box 1039, Taylor, Tex.
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Coleman Refining Co., Coleman, Tex.
Pres., Ray McGlothlin, Abilene, Tex. *Gen. Mgr.*, O. B. Stephens, Abilene, Tex. *Refinery* located at Coleman, Tex.

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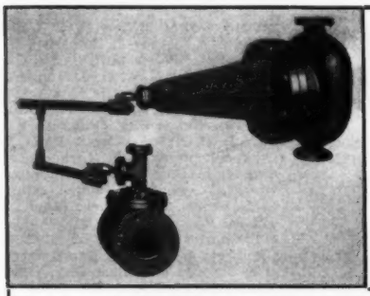
D A V I S



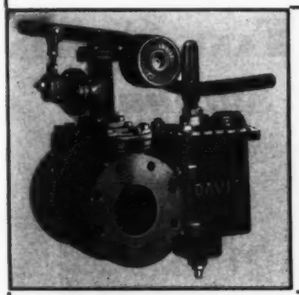
LIQUID LEVEL CONTROLS

Davis Liquid Level Controls are offered in a complete range of sizes and types, including units featuring the new "DIA-BALL" packless heads. The combination at the left shows a No. 161 D Packless Float Box actuating a No. 66 B Packless Balanced Valve.

Ask for descriptive bulletins.

STOP-AND-CHECK VALVES

Davis Stop-and-Check Valves are widely used for boiler plant protection in all branches of industry. No. 101 illustrated at the right is particularly designed for high pressure, heavy duty installations. It features an external oil dashpot, and a lever which can be moved by hand to test valve action at any time. Offered in four body patterns.



SOLENOID VALVES

Because Davis has long specialized in automatic valves for every type of service, the problem of giving you exactly what you want in a solenoid operated valve is just a matter of knowing your requirements. Standard designs are available from stock to meet practically any condition. Special assemblies can be produced on short order. The solenoid valve shown at the left is No. 97 SB featuring the "DIA-BALL" packless head and explosion-proof solenoid case. Literature on request.

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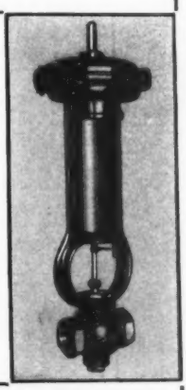
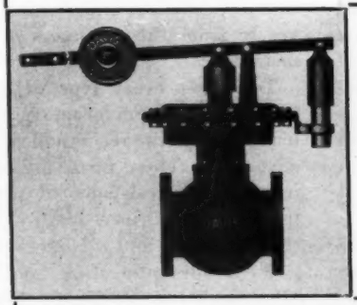
The Davis line of pressure regulators is complete—there is a type and size available to fit any job whether it be for gas, oil, steam, air, or water. Davis recommendations are not biased by any favored types. As the job dictates, you are free to choose between direct or pilot control . . . spring or weight loading . . . piston or diaphragm action. The type illustrated at the right is No. 14 C featuring a weatherproof housing for outdoor installations. CHOOSING the right type of regulator for any particular application is made easy by the new Davis Regulator Service Chart. Specifications and ratings according to service. Write for a copy.





GAS BACK PRESSURE VALVES

Davis Valves for gas service include the popular No. 330 Back Pressure Valve shown at the left. It is convertible for either vacuum or back pressure merely by reversing the counterweight. It features weatherproof construction, high sensitivity, and resistance to corrosion and wear. Complete range of standard sizes carried in stock.

STRAINERS

Davis Strainers are outstanding for their excellence of design and quality of construction. They are produced in Y-type (illustrated at right) and basket type styles. Sizes from 3/8″ to 12″ of bronze, semi-steel, or steel for steam, air, gas, water, and oil service.

DAVIS VALVES

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Concho Refining Co., Box 79, San Angelo, Tex.

Pres., R. D. Lavery. *Treas.*, C. B. Mitchell. *Supt.*, R. D. Lavery. *Refinery* located at San Angelo, Tex.

Conewango Refining Co., Warren, Pa.

Pres., Harry R. Lewis. *Sec.* and *Treas.*, T. M. Demarest. *Tankcar S. M.*, K. M. Lyons. *Ch. Chem.*, R. E. Dunham. *Pur. Agt.*, Paul Broderick. *Supt.*, W. L. Gettings. *Asst. Supt.*, K. Brogan. *Refinery* located at Warren, Pa.

Consumers Oil & Refining Co., Newcastle, Wyo.

Pres., P. N. Fortin, Yale Oil Corp., Billings, Mont. *V. P.* and *Treas.*, G. L. Culver. *Sec.*, L. B. Hancock, Yale Oil Corp., Billings, Mont. *Refinery* located at Newcastle, Wyo.

Continental Oil Co., Ponca City, Okla.

Pres., Dan Moran. *V. P.'s*, W. W. Bruce; W. H. Ferguson; Walter Miller; R. E. Collom; Harry J. Kennedy. *Sec.*, James J. Cosgrove. *Treas.*, G. F. Smith. *Gen. Mgr.*, Walter Miller. *Gen. Supt. Ref.*, Harold G. Osborn. *Sales Mgr.*, H. J. Kennedy. *Ch. Engr.*, M. E. Clawson. *Ch. Chem.*, B. H. Lincoln. *Pur. Agt.*, W. H. O'Connor. *Traf. Mgr.*, P. H. Kuhns. *Supts.*, Fred G. Fellows, Ponca City, Okla.; J. W. Brown, Baltimore, Md.; D. H. Hyler, Wichita Falls, Tex.; C. R. Tillman, Glenrock, Wyo.; J. P. Markey, Farmington, N. Mex.; Charles Morgan, Artesia, N. Mex.; J. E. Fenex, Denver, Colo.; H. H. Kinnaird, Albuquerque, N. Mex.; L. L. Smith, Lewistown, Mont. *Asst. Supts.*, J. O. Thoen, Ponca City, Okla.; W. M. Cocke, Baltimore, Md.; Charles Ramsey, Wichita Falls, Tex.; R. H. Main, Glenrock, Wyo.; J. A. Mann, Artesia, N. Mex. *Refineries* located at Ponca City, Okla.; Baltimore, Md.; Wichita Falls, Tex.; Glenrock, Wyo.; Farmington, N. Mex.; Artesia, N. Mex.; Denver, Colo.; Albuquerque, N. Mex.; Lewistown, Mont.

Continental Refining Co., Box 175, Oil City, Pa.

Receiver, W. J. Anderson. *Sec.*, Sam DeArman. *Treas.*, J. W. Anderson. *Gen. Supt. Ref.*, I. L. Klein. *Tankcar* and *Ser. Sta. S. M.*, C. H. Thomas. *Ch. Engr.*, J. C. Vogan. *Ch. Chem.*, Eugene Hanna. *Pur. Agt.*, H. Wiley. *Traf. Mgr.*, D. C. Hasson. *Refinery* located at Oil City, Pa.

Corpus Christi Refining Corp., P. O. Box 1039, Taylor, Tex.

Pres. and *Gen. Mgr.*, G. L. Rowsey. *V. P.'s*, Ben H. Harrison; J. F. Whitehurst. *Sec.*, Harris A. Melasky. *Ch. Engr.*, B. H. Perkinson. *Ch. Chem.*, D. A. Porter. *Pur. Agt.*, Ben H. Harrison. *Refinery* located at Corpus Christi, Tex.

Cosden Petroleum Corp., 1700 Electric Bldg., Fort Worth, Tex.

Pres., J. S. Cosden. *V. P.'s*, W. D. Richardson; A. G. Reed; Jenry Sweifel. *Sec.* and *Treas.*, J. W. Lane. *Gen. Mgr.*, W. D. Richardson. *Gen. Supt. Ref.*, E. W. Potter. *Ch. Engr.*, T. L. Lumly. *Ch. Chem.*, E. W. Richardson. *Pur. Agt.*, Ben C. Ammanns. *Traf. Mgr.*, D. L. Orme. *Asst. Supt.*, G. L. Lebleu, Big Spring, Tex. *Refinery* located at Big Spring, Tex.

Co-Service Oils, Inc., P. O. Box 470, Shreveport, La.

Pres. and *Gen. Mgr.*, Douglas MacDonald. *V. P.* and *Treas.*, C. R. Lake. *Sec.* N. R. Price. *Ch. Chem.*, Edward Poteet. *Traf. Mgr.*, M. B. Baird. *Asst. Supt.*, H. P. Jackson, Princeton, La. *Refinery* located at Princeton, La.

Cosco Oil Co., Electric Bldg., Fort Worth, Tex.

Pres. and *Treas.*, J. S. Cosden. *V. P.* and *Sales Mgr.*, R O.. Wilson. *Sec.*, J. W. Lane. *Ch. Chem.*, E. T. Lance. *Pur. Agt.*, B. F. Young. *Supt.*, Joe E. Ernest, Wynnewood, Okla. *Refinery* located at Wynnewood, Okla.

Crook County Refinery, Sundance, Wyo.

Owner, A. Policky. *Ch. Chem.*, J. Policky. *Refinery* located at Sundance, Wyo.

Cross, Henry H., Co., 122 S. Michigan Ave., Chicago, Ill.

Pres., H. H. Cross. *V. P.*, George F. Fox. *Sec.*, L. L. Dent. *Supts.*, Frank Hovell, Smackover, Ark.; D. L. Crandall, Colmar, Ill.; J. L. McAndrew, Dupo, Ill.; George Knupp, Joliet, Ill. *Refineries* located at Smackover, Ark.; Colmar, Ill.; Dupo, Ill.; Joliet, Ill.

Crown Central Petroleum Corp., P. O. Box 1759, Houston, Tex.

Pres., Harry A. Rosenberg, American Bldg., Baltimore, Md. *V. P.*, H. S. Lane. *Sec.*, James T. B. Bowles, American Bldg., Baltimore, Md. *Treas.*, S. K. Waters. *Asst. Sec.*, S. K. Lawhon. *Ref. Mgr.*, K. W. Shimeall. *Supt. of Ref.*, R. S. Myers. *Gen. Sales Mgr.*, Jesse Stickel, 420 Lexington Ave., New York, N. Y. *Pur. Agt.*, David Hutchinson. *Traf. Mgr.*, F. C. Clark. *Refinery* located at Houston, Tex.

Cryden Refineries, Inc., Drayton Plains, Mich.

Pres., Raymond S. Hunt. *V. P.*, H. L. Williams. *Sec.*, William B. Hartman. *Treas.* and *Gen. Mgr.*, Alan S. Gray. *Gen. Supt. Ref.*, C. E. Nix. *Refinery* located at Drayton Plains, Mich.

Crystal Refining Co. of Carson City, Inc., Carson City, Mich.

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Cusco Oil & Refining Co., The, Chase, Kans.

Receiver, Harry H. Becker, 209 Brown Bldg., Wichita, Kans. *Refinery* located at Chase, Kans.

Cushing Refining & Gasoline Co., Cushing, Okla.

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Cut Bank Refining Co., Cut Bank, Mont.

Pres. and *Gen. Mgr.*, Kenneth H. Davis. *V. P.*, R. C. Tarrant. *Sec.* and *Treas.*, J. A. Strack. *Gen. Supt. Ref.*, H. A. Lynn. *Sales Mgr.*, Oliver Silfvast. *Refinery* located at Cut Bank, Mont.

D

Danciger Oil & Refineries, Inc., Hunt Bldg., Tulsa, Okla.

Pres., Dan Danciger. *V. P.'s*, Joseph Danciger; Jack Danciger; A. Danciger. *Sec.*, J. E. Vaeth. *Treas.*, Joseph Danciger. *Tankcar S. M.*, Leo R. Brammer. *Pur. Agt.*, Jay Hausam. *Traf. Mgr.*, R. R. Maines. *Supts.*, F. E. Shryock, Pampa, Tex.; M. R. Ryan, Longview, Tex. *Asst. Supts.*, L. E. Keck, Pampa, Tex.; Ben Ferris, Longview, Tex. *Refineries* located at Pampa, Tex., and Longview, Tex.

Danube Oil Corp., Amarillo Bldg., Amarillo, Tex.

Pres., R. Underwood. *V. P.*, C. M. Humphrys. *Sec.* and *Treas.*, George Kensey. *Gen. Mgr.*, R. Underwood. *Gen. Supt. Ref.*, F. B. Marshall. *Tankcar* and *Service Sta. S. M.*, F. J. Harper. *Refinery* located at Borger, Tex.

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Pres., Dr. F. Sonneborn. *V. P.*, J. F. Roten. *Sec.*, R.

BAKELITE RESIN TANK COATINGS
that Resist Sulphur

Steep-tank for sulphur solutions protected by baking type Bakelite resin coatings made by Lithgow Corporation.

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I

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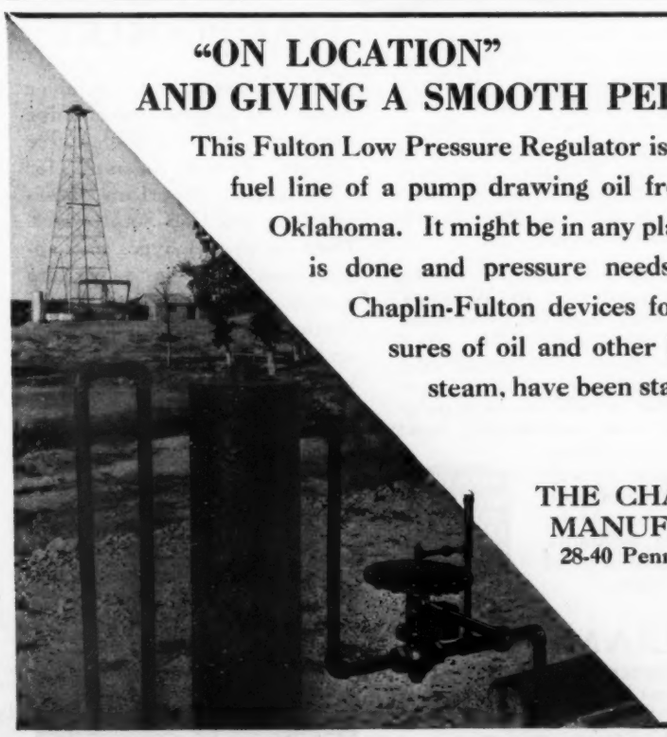

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J

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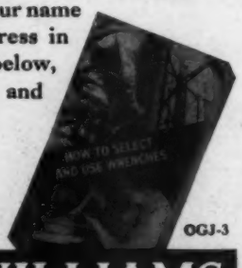

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M

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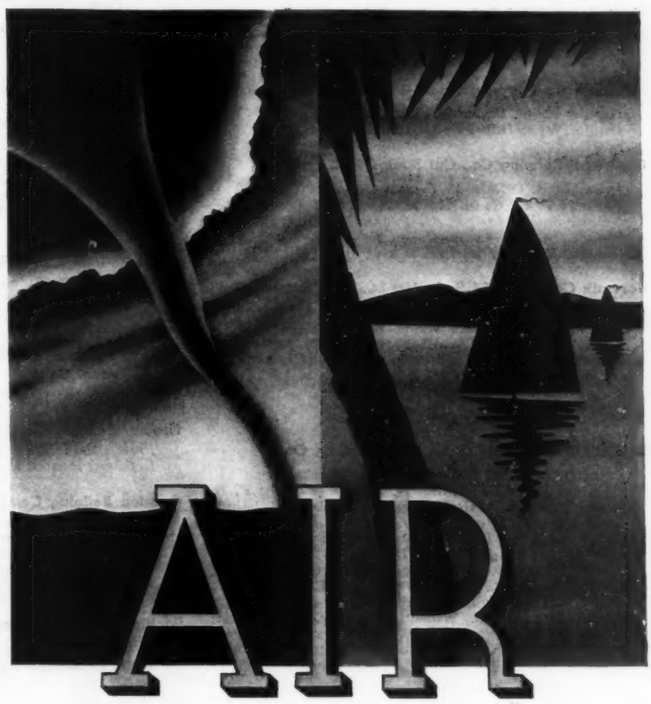
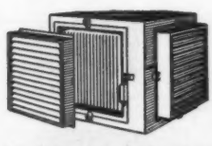


★ 

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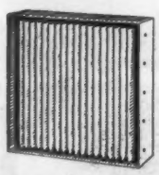
★ 

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O

Ohio Oil Co., The, 539 S. Main St., Findlay, Ohio.

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Oil Creek Refining Co., Titusville, Pa.

Pres. and *Gen. Mgr.*, Frank J. McGraw. *V. P.*, George L. Craft. *Sec.* and *Treas.*, M. D. Woods. *Gen. Supt. Ref.*, Frank Burrows. *Tankcar S. M.*, M. D. Woods. *Station S. M.*, R. Wickersham. *Ch. Engr.*, D. Beck. *Ch. Chem.*, George Acton. *Pur. Agt.*, George L. Ehrhart. *Refinery* located at Titusville, Pa.

Old Dutch Refining Co., P. O. Box 442, Muskegon, Mich.

V. P. and *Gen. Mgr.*, Earl C. Roff. *Sec.*, J. H. Bender. *Treas.*, John L. Robinson. *Sales Mgr.*, H. E. Johnston. *Ch. Engr.*, Lee H. Self. *Ch. Chem.*, John Tyson. *Pur. Agt.*, Arthur Ansmus. *Traf. Mgr.*, John L. Dalson. *Refinery* located at Muskegon, Mich.

Olney Oil & Refining Co., P. O. Box 958, Wichita Falls, Tex.

Pres., Treas., Gen. Mgr., Tankcar S. M., C. W. Cahoon, Jr. *V. P.*, Joe A. Kell. *Sec.*, C. M. Crowell. *Gen. Supt. Ref.* and *Pur. Agt.*, P. E. Slater, Olney, Tex. *Ch. Engr.*, Jack P. Slater, Olney, Tex. *Ch. Chem.*, Virgil Waggoner, Olney, Tex. *Traf. Mgr.*, C. G. Stokes. *Refinery* located at North Olney, Tex.

Olympic Refining Co., 2425 California Ave., Long Beach, Calif.

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Omar Refining Co., 505 Oklahoma Bldg., Tulsa, Okla.

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Onyx Refining Corp., Box 330, Abilene, Tex.

Pres., O. B. Stephens. *V. P.*, Ray D. McGlothlin. *Sec.*, J. B. Self. *Treas.*, O. B. Stephens. *Refinery* located at Abilene, Tex.

Operators Oil & Refining Co., 2208 E. South St., Long Beach, Calif.

Refinery located at Long Beach, Calif.

Oreana Refining Co., LaBarge, Wyo.

Pres., Veda Marie Riley. *Gen. Supt.*, S. D. Grinch. *Refinery* located at LaBarge, Wyo.

Overton Refining Co., Inc., Box 318, Overton, Tex.

Pres. and *Gen. Mgr.*, J. D. Wrather. *V. P.* and *Gen. Supt. Ref.*, John Wrather. *Sec.* and *Treas.*, George C. Walters. *Refinery* located at Overton, Tex.

P

Pacific States Oil Terminals, 550 W. Sixth St., Los Angeles, Calif.

Refinery located at Wilmington, Calif.

Paluxy Asphalt Co., Talco, Tex.

Pres., Eugene Constantin. *Supt.*, H. J. Toups. *Refinery* located at Talco, Tex.

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Pan American Southern Corp., 122 E. Forty-second St., New York, N. Y.

Pres., E. G. McKeever. *V. P.*, A. E. Ralston. *V. P.* and *Treas.*, J. A. Carroll, Jr. *Sec.*, D. H. Baker. *Pur. Agt.*, J. A. Whitely. *Traf. Mgr.*, J. S. Wood. *Refinery* located at Destrehan, La.

Panhandle Refining Co., P. O. Box 1191, Wichita Falls, Tex.

Pres., Roy B. Jones. *V. P.'s*, M. A. Chambers; R. C. Stanford; G. W. Reed. *Sec.*, H. F. Bennett. *Treas.*, M. A. Chambers. *Gen. Supt. Ref.*, W. F. Sims. *Sales Mgr.*, G. W. Reed. *Ch. Engr.*, W. F. Sims. *Ch. Chem.*, E. W. Ellis. *Pur. Agt.*, Roy J. Mann. *Traf. Mgr.*, J. H. Davenport. *Supts.*, G. D. Kinard, Wichita Falls, Tex.; J. C. Hester, Lueders, Tex.; R. W. Jacobs, Kings Mill, Tex. *Refineries* located at Wichita Falls, Tex.; Kings Mill, Tex.; Lueders, Tex.

Park Refining Co., Box 380, Cody, Wyo.

Pres., Gen. Mgr., Gen. Supt. Ref., V. M. Kirk. *V. P., Sales Mgr.*, Carroll J. Kirk. *Sec.* and *Treas.*, W. W. Lindsey. *Ch. Engr.*, James H. Shepard. *Ch. Chem.*, Kenneth E. Dyer. *Pur. Agt.* and *Traf. Mgr.*, Allen A. Campbell. *Refinery* located at Cody, Wyo.

Payward Refining Co., Box 87, Shamrock, Tex.

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Pres., G. A. Grober. *V. P.*, I. M. Grober. *Sec.* and *Treas.*, Henry Harriman. *Supt.*, Earl Phylar. *Refinery* located at Artesia, N. Mex.

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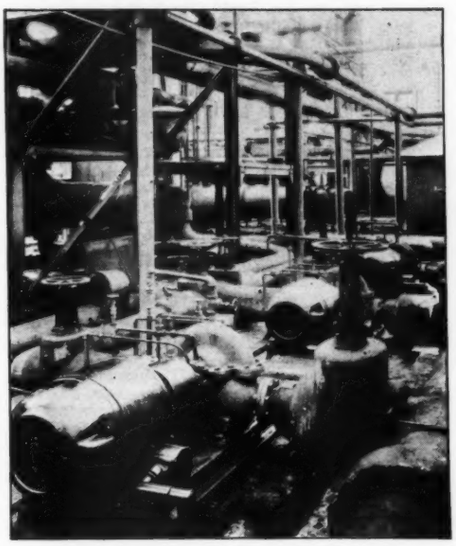
Pres., Tom E. Patton. *Refinery* located at Rotan, Tex.



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Q

Quaker State Oil Refining Corp., Quaker State Bldg., Oil City, Pa.

Pres., H. J. Crawford. *V. P.'s*, S. Messer; James D. Berry. *Sec.*, W. R. Reitz. *Treas.*, Charles D. Berry. *Gen. Supt. Ref.*, G. B. Hunter. *Pur. Agt.*, L. R. Forker. *Traf. Mgr.*, G. W. Ebert. *Supts.*, W. H. Rockman, Farmers Valley, Pa.; E. E. Ebner, Emlenton, Pa.; J. B. Northrop, St. Marys, W. Va. *Refineries* located at Farmers Valley, Pa.; Emlenton, Pa.; St. Marys, W. Va.

R

Rado Refining Co., McAllen, Tex.

Pres. and *Gen. Mgr.*, Charles J. Holland. *V. P.*, Ralph E. Fair. *Sec.* and *Treas.*, John L. Lobdell. *Refinery* located at McAllen, Tex.

Raven Oil & Refining Co., Rangely, Colo.

Pres., John J. Sloan. *V. P.*, George D. Merkley. *Sec., Treas.* and *Gen. Mgr.*, R. A. Bryson. *Refinery* located at Rangely, Colo.

Red River Refining Co., 4323 S. Western Blvd., Chicago, Ill.

Pres., P. B. Flynn. *V. P.*, Pierre Goodrich. *Sec.* and *Treas.*, R. S. Watt. *Gen. Supt. Ref.*, C. A. Harris. *Ch. Chem.*, Ed Lamasney. *Traf. Mgr.*, W. B. Hoffman. *Asst. Supt.*, A. M. Conrad, Burnham, Ill. *Refinery* located at Burnham, Ill.

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Resolute Oil Corp., Strain Bldg., Great Falls, Mont.

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Richfield Oil Corp., 555 S. Flower, Los Angeles, Calif.

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Ring Oil Co., Ltd., 506 Garfield Bldg., Los Angeles, Calif.

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Rock Island Refining Co., Box 671, Duncan, Okla.

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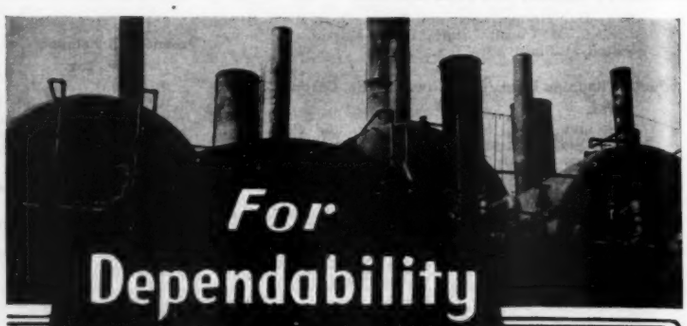

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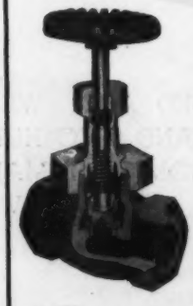

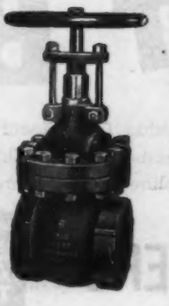

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Pres., John J. Rowe. *V. P.'s* William R. Foulkes; Charles W. Finch; E. Webster Harrison. *Sec.* and *Treas.*, Frank H. Blum. *Gen. Supt. Ref.*, R. L. Mong. *Refinery* located at Sunbright, Morgan County, Tenn.

S

Salt Creek Refining Co., 112 S. Center St., Casper, Wyo.

Pres., A. E. Winter. *V. P.*, C. R. Cantrill. *Sec.* and *Treas.*, Thomas C. Spears. *Supt.*, Dave Gillespie, Columbine, Wyo. *Refinery* located at Columbine, Wyo.

San Antonio Refining Co., Southton, Tex.

Partnership, Dr. J. S. Swearingen and Otto Gerbes. *Refinery* located at Southton, Tex.

San Fernando Refining Co., Box 310, San Fernando, Calif.

Owner, J. O. Moffett. *Gen. Supt. Ref.*, William D. Parks. *Ch. Chem.*, L. G. Haworth. *Pr. Agt.*, E. A. Ericson. *Refinery* located at Newhall, Calif.

Seaboard Refining Co., Pescataway, N. J.

Treas., Allen H. Clarke, 80 Broad St., New York, N. Y. *Gen. Supt.*, George Benhoff. *Refinery* located at Pescataway, N. J.

Seaside Oil Co., 330 State St., Santa Barbara, Calif.

Pres., M. W. O'Brien. *V. P.* and *Gen. Mgr.*, H. B. Kellogg. *Sec.*, G. C. Howell. *Treas.*, H. L. Harms. *Gen. Supt. Ref.*, D. C. Peet. *Ser. Sta. S. M.*, F. E. McClaren. *Pur. Agt.*, E. H. Beresford. *Asst. Supt.*, Don E. Searles, Ventura, Calif. *Refinery* located at Ventura, Calif.

Shallow Water Refining Co., The, P. O. Box 76, Shallow Water, Kans.

Pres., Morten Brown, Kansas City, Mo. *V. P.*, M. E. White, Great Bend, Kans. *Sec.*, D. M. Dryden, Colorado Springs, Colo. *Treas.*, J. B. Allison, McPherson, Kans. *Gen. Mgr.*, Robert D. Jordan, Garden City, Kans. *Gen. Supt. Ref.*, Cash Brisby, Scott City, Kan. *Ch. Chem.*, Harry D. Caplan, Scott City, Kans. *Traf. Mgr.*, C. L. Crenshaw. *Refinery* located at Shallow Water, Kans.

Shamrock Oil & Gas Corp., The, Amarillo Bldg., Amarillo, Tex.

Pres., John J. Sheerin. *V. P.'s*, Robert T. Wilson; H. C. Fownes, II. *Gen. Mgr.*, Robert T. Wilson. *Gen. Supt. Ref.*, E. C. Will. *Tankcar S. M.*, R. B. Woolf, McKee plant, Sunray, Tex. *Ch. Engr.*, F. B. Mack. *Ch. Chem.*, Carroll E. Gregg. *Supt.*, H. B. Wade, Meldavis Refinery, Lefors, Tex. *Refineries* located at Sunray, Tex.; Lefors, Tex.

Shell Oil Co., 100 Bush St., San Francisco, Calif.

Pres., S. Belither. *V. P.'s*, F. A. C. Guepin; J. U. Stair; E. F. Davis; D. Heggie; W. P. Durkee; G. H. Van Senden. *Sec.*, A. R. Bradley. *Treas.*, D. Heggie. *Refineries* located at Martinez, Calif.; Wilmington. Calif.; Dominguez, Calif.; Coalinga, Calif.

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Shelly Refining Co., Box 1191, Bay City, Tex.

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Stone Oil Co., 2115 Second National Bldg., Houston, Tex.

Pres., R. W. Stone. *V. P.*, H. M. Stone. *Sec.* and *Treas.*,

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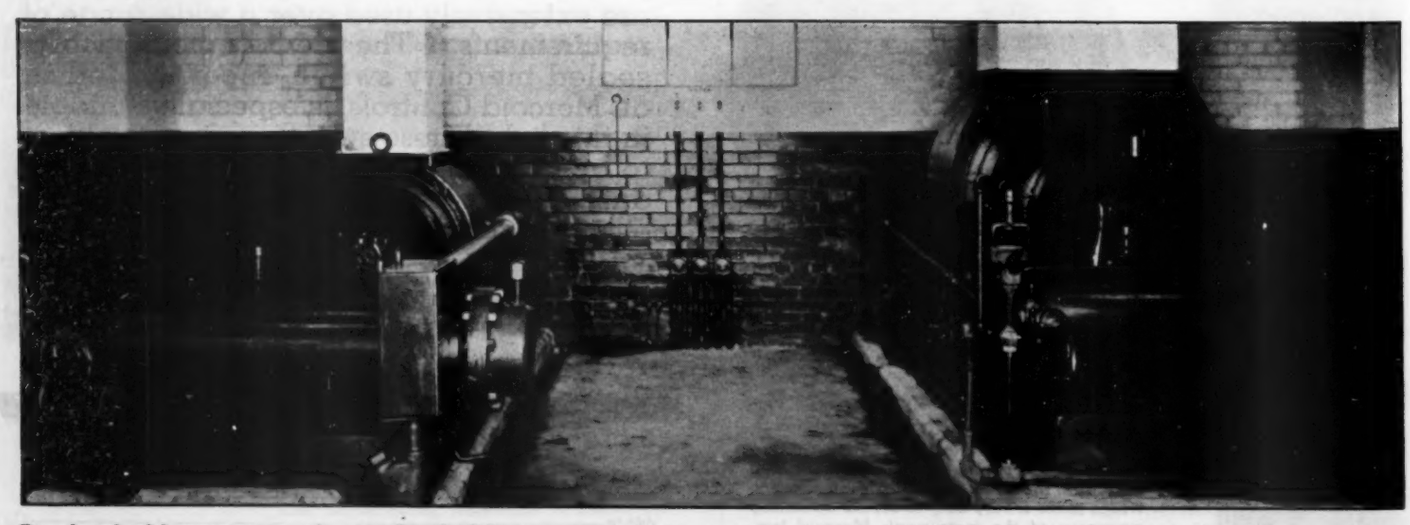

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Refinery located at Compton, Calif.

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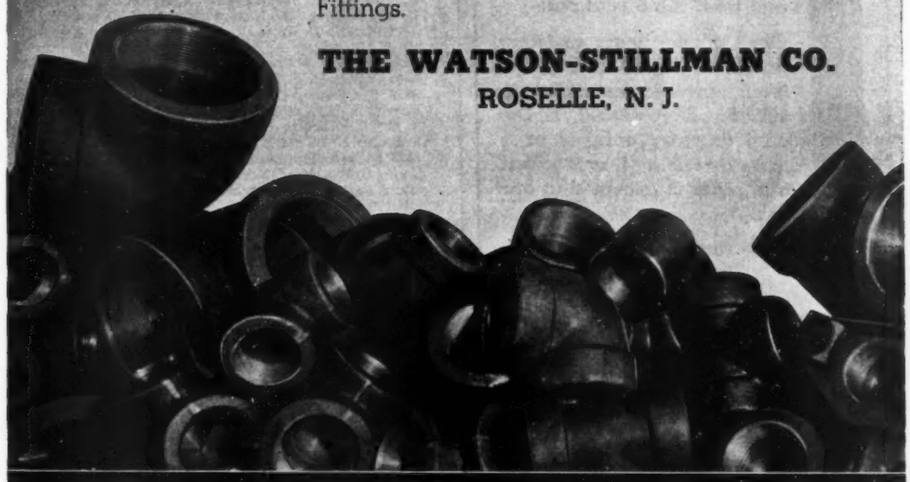

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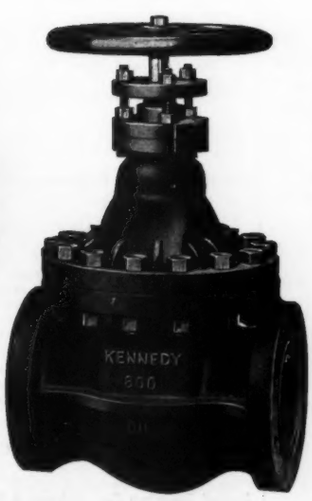

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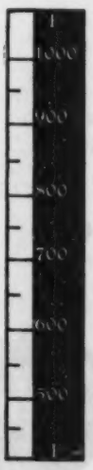

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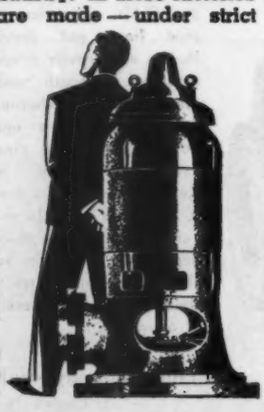

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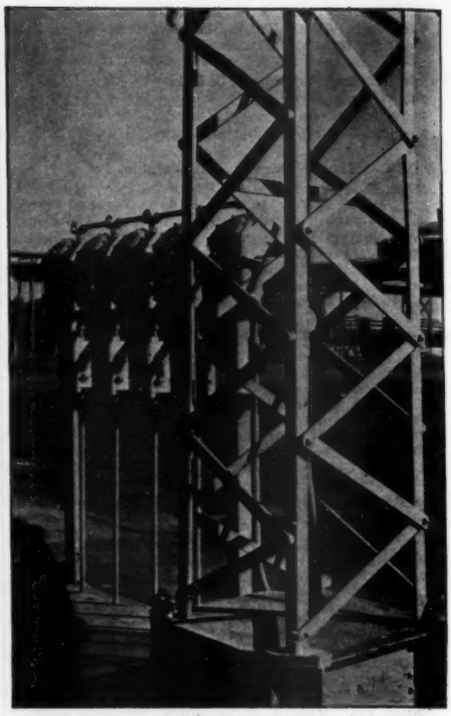

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Burlington Refineries, Ltd., Burlington St., E., Hamilton, Ontario, Canada.

Pres., S. J. Sackett. *V. P.* and *Gen. Mgr.*, G. J. Gibson. *Sec.*, T. H. Simpson. *Gen. Supt. Ref.*, T. Boutilier. *Traf. Mgr.*, M. C. Matthews. *Refinery* located at Hamilton, Ontario, Canada.

C

Canadian Oil Companies, Ltd., 12 Strachan Ave., Toronto, Ontario, Canada.

Pres. and *Gen. Mgr.*, F. H. Littlefield. *V. P.'s*, W. H. Lamprecht; F. C. West. *Sec.*, H. F. Hoecker. *Treas.*, C. W. Walker. *Gen. Supt. Ref.*, E. A. Smith. *Pur. Agt.*, G. S. Middaugh. *Traf. Mgr.*, C. E. Wilfong. *Refinery* located at Petrolia, Ontario, Canada.

Champlain Oil Products, Ltd., Sun Life Bldg., Montreal, Quebec, Canada.

Chm. Bd., Harry Snyder. *Pres.*, F. T. McKean. *Sec.*, J. E. L. Duquet. *Treas.*, F. E. Smith. *Sales Mgr.*, J. O. Tremblay. *Station S. M.*, K. B. Wilkinson. *Refinery* located at Montreal, Quebec, Canada.

Consumers Co-Operative Refineries, Ltd., P. O. Box 399, Regina, Saskatchewan, Canada.

Pres., E. E. Frisk, Kronau, Saskatchewan. *V. P.'s*, C. O. Smith; V. C. Thomas, Milestone, Saskatchewan; W. H. Johnstone, Moose Jaw, Saskatchewan. *Sec.* and *Treas.*, H. L. Fowler. *Gen. Supt. Ref.*, O. B. Males. *Ch. Chem.*, Don G. Crook. *Asst. Supt.*, C. C. Humbert. *Refinery* located at Regina, Saskatchewan, Canada.

E

Eston Refining Co., Ltd., Eston, Saskatchewan, Canada.

Pres., Wm. Hollar. *Treas.*, H. B. Larson. *Gen. Mgr.*, G. B. McDonald. *Supt.*, H. C. Spaetgens. *Refinery* located at Eston, Saskatchewan, Canada.

F

Fraser Refining Co., J. W., Wainwright, Alberta, Canada.

Owner, J. W. Fraser. *Refinery* located at Wainwright, Alberta, Canada.

G

Gas & Oil Products, Ltd., 300 Lancaster Bldg., Calgary, Alberta, Canada.

Pres., A. H. Mayland. *V. P.*, H. S. Price. *Sec.* and *Treas.*, W. Kemp. *Gen. Supt. Ref.*, L. A. Boyd. *Sales Mgr.*, W. H. Jones. *Ch. Chem.*, G. E. S. Georgescue. *Refinery* located at Hartell, Alberta, Canada.

Gold Standard Oils, Ltd., Box 68, Wainwright, Alberta, Canada.

Pres., W. B. Underhill, Barrie, Ontario, Canada. *V. P.*, M. R. Cowell, 262 Jarvis St., Toronto, Ontario, Canada. *Sec.*, W. A. Keenan. *Ch. Engr.*, P. Rutherford. *Ch. Chem.*, J. L. Howes. *Refinery* located at Wainwright, Alberta, Canada.

Goodrich Refining Co., Ltd., Port Credit, Ontario, Canada.

Pres., R. Rosefield. *V. P.*, *Sec.* and *Treas.*, J. H. Davis. *Gen. Supt. Ref.*, F. K. Davis. *Ch. Chem.*, L. E..

Burrell. *Pur. Agt.*, C. B. Edmanson. *Traf. Mgr.*, J. W. Cunningham. *Refinery* located at Port Credit, Ontario, Canada.

H

Hi-Way Refineries, Ltd., 714 Broder Bldg., Regina, Saskatchewan, Canada.

Pres., S. J. Sackett, Chicago, Ill. *V. P.*, C. B. Keenleyside. *Sec.* and *Treas.*, W. C. Marguardt. *Gen. Mgr.*, A. O'Brien. *Gen. Supt Ref.*, J. A. Kelly. *Supts.*, S. Robertson, Regina, Sask.; C. Grieve, Moose Jaw, Sask.; W. Knipfell, Swift Current, Sask.; B. L. Colwell, Rosetown, Sask.; Charles Hay, Saskatoon, Sask.; J. Kershaw, Prince Albert, Sask.; Ed Wisland, Wayburn, Sask. *Refineries* located at Regina, Sask.; Moose Jaw, Sask.; Swift Current, Sask.; Rosetown, Sask.; Prince Albert, Sask.; Weyburn, Sask., Canada.

Home Oil & Refining Co., Ltd., Humboldt, Saskatchewan, Canada.

Pres., H. C. Karels. *Sales Mgr.*, J. A. Schaeffer. *Refinery* located at Humboldt, Saskatchewan, Canada.

Home Oil Distributors, Ltd., 555 Burrard St., Vancouver, British Columbia, Canada.

Pres., H. G. Fowler. *Sec.* and *Treas.*, A. Davis. *Gen. Mgr.*, E. H. Teagle. *Gen. Supt. Ref.*, D. Fraser. *Tankcar S. M.*, L. J. Martin. *Ch. Chem.*, H. Willis. *Pur. Agt.*, S. F. Barbour. *Refinery* located at North Vancouver, British Columbia, Canada. (Operated as Vancouver Oil Co., Ltd.)

I

Imperial Oil, Ltd., 56 Church St., Toronto 2, Ontario, Canada.

Pres., G. H. Smith. *V. P.'s*, C. A. Eames; R. V. LeSueur; L. C. McCloskey; John McNeil. *Sec.* and *Treas.*, F. E. Holbrook, Sarnia, Ontario, Canada. *Gen. Mgr. Ref.*, G. L. Stewart. *Sales Mgr.*, A. E. Halverson. *Ch. Engr.*, T. Montgomery, Sarnia, Ontario, Canada. *Ch. Chem.*, B. Gouiston, Sarnia, Ontario, Canada. *Pur. Ag't.*, L. E. Bury. *Traf. Mgr.*, W. H. Dickie. *Supts.*, A. .. Grant, Ioco, British Columbia; C. M. Moore, Calgary, Alberta; A. C. Harrop, Regina, Saskatchewan; C. E. Carson *(Gen. Supt.)*, Sarnia, Ontario; J. D. Bradley *(Ref. Supt.)*, Sarnia, Ontario; F. C. Mechin, Montreal, Quebec; R. L. Dunsmore, Halifax, Novia Scotia. *Asst. Supts.*, C. E. Stone, Ioco, British Columbia; J. J. Hanna, Calgary, Alberta, C. R. Moore, Regina, Saskatchewan; J. W. MacDonald, Sarnia, Ontario: L. T. McNaughton, Montreal, Quebec; R. D. King, Halifax, Nova Scotia. *Refineries* located at Ioco, British Columbia; Calgary, Alberta; Regina, Saskatchewan; Sarnia, Ontario; Montreal, Quebec; Halifax, Nova Scotia, Canada.

L

Lion Refining Co., 817 Fourth St., East, Calgary, Alberta, Canada.

Gen. Mgr. and *Tankcar S. M.*, Leon L. Plotkins. *Gen. Supt. Ref.*, Leo S. Sweeney. *Station S. M.*, Robert T. Gilbert. *Ch. Engr.* and *Ch. Chem.*, John P. Collier. *Asst. Supt.*, Howard Good. *Refinery* located at Calgary, Alberta, Canada.

Mc

McColl-Frontenac Oil Co., Ltd., 360 St. James St., W., Montreal, Quebec, Canada.

Pres., John Irwin. *V. P.'s*, P. A. Thomson; H. H. Bradburn; S. S. Griffiths. *Air Vice Marshal*, W. A. Bishop. *V. P. in Chg. Oper.*, J. A. Wales. *V. P. in Chg. Sales.*, J. M. Prichard. *Sec.* and *Treas.*, Fred Hunt. *Ch. Engr.*, R. C. Kinzer. *Ch. Chem.*, G. R. Taylor. *Pur. Agt.*, B. F. Stanton. *Traf. Mgr.*, G. E. V. Smith. *Supts.*, J. D. Brown, Montreal; R. F. Dimmitt, Toronto. *Asst. Supt.*, C. B. W. Anderson, Montreal. *Refineries* located at Montreal and Toronto, Canada.

M

Mid-West Refineries, Ltd., Box No. 475, Dauphin, Manitoba, Canada

Pres., Herman Deering. *V. P.*, Frank Orland Wright. *Sec.* and *Treas.*, Arthur N. Kerry. *Gen. Mgr.*, Frank Orland Wright. *Refinery* located at Dauphin, Manitoba, Canada.

N

Nead Oil Refineries, Ltd., 45 Richmond St., W., Toronto, Ontario, Canada.

Pres. and *Gen. Mgr.*, Armour Jay Dean. *V. P.*, *Sec.* and *Treas.*, Bernard Benjamin Martin. *Plant* to be constructed at Owen Sound, Ontario, Canada.

Northern Petroleum Corp., Ltd., Kamsack, Saskatchewan, Canada.

Pres., Stanley Coxon. *V. P.* and *Pur. Agt.*, John Kalmacoff. *Sec.* and *Treas.*, Jacob E. Kalmacoff. *Refinery* located at Kamsack Sask., Canada.

North Star Oil, Ltd., Scott Block, Winnipeg, Manitoba, Canada.

Pres., Col. G. T. Chisholm, Oiser & Hammond, Toronto, Ontario. *V. P.'s*, W. T. Gwyn; T. N. Clayton. *Sec.*, A. Havelock. *Treas.*, W. T. Gwyn. *Gen. Mgr.*, T. N. Clayton. *Gen. Supt. Ref.*, C. Johnson. *Sales Mgr.*, W. R. MacArthur. *Ch. Chem.*, J. Sill. *Traf.*, J. H. Ireland. *Refinery* located at St. Boniface, Manitoba.

O

Oughton Bros., Box 81, Calgary, Alberta, Canada.

Partnership. Mgr., L. Oughton. *Refinery* located at Mercury Camp, Turner Valley, Alberta, Canada.

R

Radio Oil Refineries, Ltd., Winnipeg, Manitoba, Canada.

Pres., F. M. Sures. *V. P.* and *Sales Mgr.*, B. Hechter. *Sec.* and *Treas.*, M. Hechter. *Gen. Supt. Ref.*, W. J. Dubesky. *Refinery* located at Winnipeg, Manitoba, Canada.

S

Shell Oil Co. of British Columbia, Ltd., 789 W. Pender St., Vancouver, British Columbia, Canada

Pres., S. Belither. *V. P.'s*, D. Heggie; W. P. Durkee; C. E. Anstie. *Sec.*, A. R. Bradley. *Treas.*, D. Heggie. *Sales Mgr.*, W. H. Hagans. *Ser. Sta. S. M.*, A. L. Wilson. *Pur. Agt.*, W. H. Ball. *Supt.*, H. H. Hale. *Refinery* located at Shellburn, British Columbia, Canada.

Shell Oil Co. of Canada, Ltd., 25 Adelaide St., East, Toronto, Ontario, Canada.

Pres. and *Gen. Mgr.*, P. M. Fowlie. *V. P.* and *Sales Mgr.*, N. Y. Knox. *Sec.* and *Treas.*, O. B. Roger. *Gen. Supt. Ref.*, D. M. Morrison. *Ch. Engr.*, R. G. Blackburn. *Ch. Chem.*, R. G. Wilkinson. *Pur. Agt.*, J. E. Halford. *Asst. Supt.*, E. W. Thompson. *Refinery* located at Montreal, Quebec, Canada.

Standard Oil Co. of British Columbia, Ltd., 225 Bush St. San Francisco, Calif.

Pres., R. K. Davies. *Exec. V. P.*, G. E. Kennedy. *V. P.'s*, H. D. Collier; S. E. Nord. *Sec.*, B. W. Letcher. *Treas.*, V. F. Palmer. *Refinery* located at Burnaby, British Columbia, Canada.

Soo Refinery, Ldt., Weyburn, Saskatchewan, Canada.

Pres., S. E. Oscarson. *V. P.*, E. H. Phillips, *Sec.*, *Treas.* and *Mgr.*, A. J. Onstad. *Refinery* located at Weyburn, Sask., Canada.

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Refineries Operating in United States

Explanation of Terms Used in Operating Survey

(Comp.)—Complete plant, gasoline, kerosene, gas oil, fuel oil, lubricating oils, paraffin, wax, petroleum coke, asphalt or both coke and asphalt, usually includes cracking. Some plants listed as complete do not manufacture asphalt or coke.

(S)—Gasoline, kerosene distillate, gas oil and fuel oil.

(L)—Gasoline, kerosene distillate, gas oil, fuel oil, and lubricating oils.

(A)—Gasoline, kerosene distillate, gas oil, fuel oil and asphalt.

(T)—Tops, distillate, gas oil and fuel oil.

(C)—Same products as skimming, except equipped for cracking.

(W)—Wax.

Where plant includes cracking, lubricating oil and asphalt, (S) is omitted as skimming is implied.

(Crude Cap.)—Maximum number of barrels of crude the plant is able to process daily.

(Gasoline Cap.)—Maximum number of barrels of gasoline the plant is able to make daily, including natural gasoline needed in blend.

ALABAMA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Coastal Petroleum Corp., Mobile	4,000	.....	S	

ARKANSAS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Berry Asphalt Co., Waterloo	2,000	.....	S-L-A	
Cross Co., Henry H., Smackover	6,000	1,500	S-C-L	Donnelly
Lion Oil Ref. Co., El Dorado	17,000	4,000	Comp.	Own
Macmillan Pet. Corp., Norphlet	2,500	.....	S-L-A	
Root Pet. Co., El Dorado	10,000	5,500	Comp.	Winkler-Koch
Stephens Ref. Co., Stephens	750	.....	S	
Total	38,250	11,000		

CALIFORNIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Airline Pet. Corp., Oildale	500	.....	S-L	
Aromalene, Inc., Signal Hill	2,000	.....	S	
Bachmann Pet. Corp., Signal Hill	5,000	.....	S	
Bush Oil Co., R. R., Long Beach	4,000	.....	S	
Caminol Co., Ltd., Santa Fe Springs	4,600	.....	S	
Caminol Co., Ltd., Hanford	3,000	.....	S	
Capitol Crude Oil Co. of Los Angeles, Santa Paula	160	.....	S	
Eagle Oil & Ref. Co., Santa Fe Springs	1,200	.....	S	
East West Ref. Co., Los Angeles	2,000	.....	S	
Edington Oil & Ref. Co., Ltd., Signal Hill	4,500	.....	S	
El Camino Ref. Co., Los Alamitos	3,000	.....	S	
Elm Oil Co., Ltd., Long Beach	2,500	.....	S	
El Tejon Oil & Ref. Corp., Bakersfield	3,500	2,000	S-C	Cross
Envoy Pet. Co., Long Beach	3,500	.....	S	
Estado Pet. Corp., Long Beach	12,000	.....	S	
Exeter Ref. Co., Long Beach	10,000	.....	S-A	
Field Gasoline Corp., O. C., Casmalia	1,000	.....	S-A	
Fletcher Oil Co., Inc., Los Angeles	5,000	.....	S	
General Pet. Corp. of Calif., Vernon	28,000	.....	S	
General Pet. Corp. of Calif., Torrance	52,000	20,000	S-C	Kellogg
General Pet. Corp. of Calif., Lebec	12,000	.....	S	
Gilmore Oil Co., Los Angeles	2,500	.....	S-A	
Gilmore Oil Co., Santa Maria	1,500	.....	S-A	
Golden Bear Oil Co., Oildale	3,000	.....	L-A	
Hancock Oil Co. of Calif., Long Beach	12,500	6,250	S-C	Own
Harbor Ref. Co., Inc., Long Beach	2,500	.....	S	
Interstate Oil Corp., Taft	250	.....	S	
Krieger Oil Co. of Calif., Clearwater	3,000	.....	S	
Lake View Oil & Ref. Co., Maricopa	3,000	.....	S	
McCallen Ref. Co., Huntington Beach	2,800	.....	S-A	
Macmillan Pet. Corp., Long Beach	7,500	.....	S	
Marquette Ref. Co., Los Angeles	1,100	.....	S	
Mercury Pet. Corp., Venice	3,000	700	S-A	
Mohawk Pet. Co., Bakersfield	10,000	6,500	C-A	Own
Norwalk Co., The, Maricopa	4,000	.....	S	
Olympic Ref. Co., Long Beach	6,500	.....	S	
Operators Oil & Ref. Co., Long Beach	1,200	.....	S	
Pacific States Oil Terminals, Wilmington	2,500	.....	S	
Petrol Corp., Los Angeles	10,000	.....	S-A	
Richfield Oil Corp., Watson	100,000	76,000	Comp.	Black
Richfield Oil Corp., Hynes	55,000	14,000	S-C	Cross
Richfield Oil Corp., Vinvale	10,000	3,000	S-C	Sinclair
Rothschild Oil Co., Santa Fe Springs	3,000	.....	S	
San Fernando Ref. Co., Newhall	2,500	.....	S-A	
Seaside Oil Co., Ventura	5,000	.....	S-A	
Shell Oil Co., Martinez	24,500	28,500	S-C-L-A	Dubbs
Shell Oil Co., Wilmington	36,000	13,000	S-C	Dubbs
Shell Oil Co., Dominguez	....	41,500	S-C	Dubbs
Shell Oil Co., Coalinga	4,700	.....	S	
Socal Oil & Ref. Co., Huntington Beach	3,500	.....	S	
Steiner, Walter, Ref. Co., Long Beach	2,500	.....	S-L	

CALIFORNIA (Continued)

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
St. Helens Pet. Co., Ltd., Pico	3,500	.....	S	
Standard Oil Co. of Calif., Richmond	100,000	56,000	Comp.	Dubbs
Standard Oil Co. of Calif., El Segundo	100,000	85,000	Comp.	Dubbs
Standard Oil Co. of Calif., Seguro	25,000	.....	S-A	
Super Asphalt Prod. Co., Long Beach	1,500	.....	S-A	
Telegraph Ref. Corp., Compton	2,000	.....	S	
Texas Co., Los Angeles	37,000	9,000	S-C	Holmes-Manley
Texas Co., Fillmore	4,000	3,000	S-C	Cross
Tide Water Associated Oil Co., Avon	55,000	28,000	Comp.	Tube & Tank
Tide Water Associated Oil Co., Watson	10,000	7,500	S-C	Tube & Tank
Triangle Oil & Ref. Co., Venice	3,000	.....	S	
Union Oil Co. of Calif., Wilmington	73,000	6,000	Comp.	Cross
Union Oil Co. of Calif., Oleum	20,000	12,000	Comp.	
Union Oil Co. of Calif., Bakersfield	5,000	.....	S	
Union Oil Co. of Santa Paula	1,200	.....	S	
Wilshire Oil Co., Inc., Norwalk	15,000	12,000	S-C	Dubbs
Yosemite Oil Ref. Co., Fruitvale	1,500	.....	S	
Total	939,710	429,950		

COLORADO

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Bay Pet. Corp., Denver	3,000	1,200	S-C	Dubbs
Continental Oil Co., Denver	1,850	1,000	S-C	Cross
Oriental Ref. Co., Denver	750	.....	S	
Perry Pet. Co., Adams City	800	.....	S	
Raven Oil & Ref. Co., Rangely	200	.....	S	
Star Oil & Ref Corp., Fort Morgan	140	.....	S	
Texas Co., Craig	1,200	1,200	S-C	Holmes-Manley
Universal Refineries, Inc., Pueblo	*1,500	.....	S	
Total	9,440	3,400		

*Under construction.

DELAWARE

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Texas Co., Claymont	3,500	.....	S	

GEORGIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Pan American Ref. Corp., Savannah	4,000	.....	A	

ILLINOIS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Calument Ref. Co., Burnham	1,200	.....	L	
Cross Co., Henry H., Colmar	1,000	.....	S	
Cross Co., Henry H., Dupo	1,000	.....	S	
Globe Oil & Ref. Co., Lemont	16,500	8,000	S-C	Winkler-Koch
Indian Ref. Co., Lawrenceville	16,000	7,000	Comp.	deFlorez
Ohio Oil Co., Robinson	10,000	5,000	S-C-A	Holmes-Manley
Red River Ref. Co., Burnham	1,200	.....	L	
Shell Pet. Corp., Wood River	43,000	29,500	Comp.	Dubbs, T.V.P., Cross
Socony-Vacuum Oil Co., Inc. (Lubrite), East St. Louis	7,200	4,750	S-C	Pratt Vapor Phase
Standard Oil Co. (Ind.), Wood River	20,300	20,000	Comp.	Modified Holmes-Manley
Texas Co., Lockport	25,000	18,100	Comp.	Holmes-Manley deFlorez Pressure Coke
Total	142,400	92,350		

INDIANA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Cities Service Oil Co. (Del.), East Chicago	25,000	15,000	S-C	
Shell Pet. Corp., East Chicago	30,000	21,000	S-C	Dubbs
Sinclair Ref. Co., East Chicago	40,000	30,000	Comp.	Sinclair 600
Standard Oil Co. (Ind.), Whiting	109,100	90,900	Comp.	Combination Cracking, Cross Holmes-Manley
Troy Ref. Corp., Troy	150	.....	S	
Wadhams Oil Co., East Chicago	12,000	7,000	S-C	Comb.
Total	216,250	163,900		

KANSAS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Barnsdall Ref. Corp., Wichita	5,000	2,500	S-C	Dubbs
Bay Pet. Corp., McPherson	3,000	1,000	S-C	Dubbs
Chanute Ref. Co., Chanute	....	1,000	C	Jenkins
Derby Oil Co., Wichita	8,000	3,000	S-C	Dubbs
El Dorado Ref. Co., Eldorado	6,000	3,000	S-C	Winkler-Koch
Falcon Ref. Co., Great Bend	1,000	.....	S	

KANSAS (Continued)

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Fredonia Oil & Ref. Co., Fredonia	250	.....	S	
Globe Oil & Ref. Co., McPherson	12,000	6,000	S-C	Winkler-Koch
Kanotex Ref. Co., Arkansas City	12,000	4,500	S-C-A	Donnelly
National Ref. Co., Coffeyville	8,000	4,000	Comp.	Own
Petroleum Products Co., Chanute	1,000	800	S-C	Winkler-Koch
Phillips Pet. Co., Kansas City	23,000	7,000	S-C	Dubbs & Own
Roper Pet. Co., Parsons	500	.....	S	
Shallow Water Ref. Co., Shallow Water	2,000	.....	S-A	
Shell Pet. Corp., Arkansas City	20,000	9,700	S-C	Dubbs
Skelly Oil Co., Eldorado	23,000	15,000	S-C-A	Winkler-Koch
Sinclair Ref. Co., Kansas City	11,000	7,000	S-C	Sinclair 600
Sinclair Ref. Co., Coffeyville	12,000	7,000	Comp.	Sinclair 600
Socony-Vacuum Oil Co., Inc. (White Eagle), Augusta	20,000	20,000	S-C-A	Own
Standard Oil Co. (Ind.), Neodesha	7,500	4,900	S-C	Combination Cracking
United Ref. Co., Russell	1,200	700	S-C	Donnelly
Vickers Pet. Co., Potwin	4,000	2,000	S-C	Dubbs
Total	180,450	99,100		

KENTUCKY

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Aetna Oil Service, Inc., Louisville	3,500	2,000	S-C	
Ashland Oil & Ref. Co., Catlettsburg	4,500	2,400	S-C-A	Dubbs
Louisville Ref. Co., Inc., Louisville	5,000	3,500	S-C	Dubbs
South Kentucky Pipe Line Co., Somerset	400	.....	S	
Standard Oil Co. (Ohio), Latonia	7,700	5,000	S-C-A	Tube & Tank
Stoll Oil Ref. Co., Louisville	2,000	500	S-C-L	Own
Texas Co., Pryse	2,500	2,000	S-C	Holmes-Manley
Total	25,600	15,400		

LOUISIANA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Arkansas Fuel Oil Co., Bossier City	23,000	15,000	S-C	Tube & Tank, Own
Atlas Pipe Line Corp., Shreveport	12,000	6,000	Comp.	Gyro
Bayou State Oil Corp., Hosston	750	.....	L	
Chalmette Pet. Corp., Chalmette	8,500	6,000	S-C	Kellogg
Co-Service Oils, Inc., Princeton	750	.....	S-L-A	
East Texas Ref. Co., Rodessa	4,000	.....	S	
Pan American Pet. Corp., Destrehan	10,000	.....	S-A	
Premier Oil Ref. Co. of Tex., Webster Parish	3,000	.....	S	
Rodessa Oil & Ref. Corp., Cedar Grove	10,000	4,500	S-C	Own
Shell Pet. Corp., Norco	21,000	14,000	S-C-A	Dubbs
Southwestern Oil & Ref. Co., Inc., Lake Charles	5,000	.....	S	
Standard Oil Co. of La., Baton Rouge	90,000	40,000	Comp.	Tube & Tank
Stanolind Oil & Gas Co., Superior	4,500	2,000	S-C	Cross
Texas Co., Shreveport	7,000	.....	S	
Total	199,500	87,500		

MARYLAND

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Continental Oil Co., Baltimore	7,500	3,500	S-C-A	Cross
Pan American Ref. Corp., Baltimore	8,000	.....	S-A	
Standard Oil Co. of N. J., Baltimore	28,000	48,000	Comp.	Tube & Tank
Total	43,500	51,500		

MASSACHUSETTS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Cities Service Oil Co. of Pa., East Braintree	20,000	8,000	S-C-L-W	Cities Service
Colonial Beacon Oil Co., Inc., Everett	54,000	19,000	S-C-A	Tube & Tank
Total	74,000	27,000		

MICHIGAN

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Aurora Gasoline Co., Detroit	2,000	.....	S	
Aurora Gasoline Co., Elsie	3,000	.....	S	
Bair Oil Co., F. M., Grand Ledge	500	.....	S	
Bay Ref. Co., Bay City	3,500	.....	S	
Crystal Ref. Co. of Carson City, Inc., Carson City	2,000	.....	S	
Imperial Ref. Co., Grand Rapids	3,000	.....	S	
Inter-Lakes Ref. Co., Detroit	1,300	900	S-C	McKee-O'Con
Keystone Oil Ref. Co., Detroit	2,000	.....	S-L	
Leonard Refineries, Inc., Alma	3,000	1,400	S-C	Dubbs
Lube Oil Corp., Alma	700	.....	L-W-A	
McClanahan Refineries, Inc., St. Louis	3,500	1,250	S-C	Dubbs
Midwest Refineries, Inc., Alma	3,000	.....	S	
Naph-Sol Ref. Co., Muskegon	3,500	1,500	S-C	Dubbs
Northern Refineries, Inc., Alma	2,500	.....	S	
Old Dutch Ref. Co., Muskegon	3,000	1,500	S-C	T.V.P.
Peerless Oil Co., Saginaw	1,000	.....	S	
Producers Ref., Inc., West Branch	1,500	.....	S	
Pure Oil Co., Midland	3,000	.....	S	
Roosevelt Oil Co., Mount Pleasant	5,500	.....	S-L	
Socony-Vacuum Oil Co., Inc., Trenton	13,900	5,775	S-C	
Sovereign Ref. Co., Saginaw	1,000	.....	S	
State Ref. Co., Grand Rapids	1,500	.....	S	
Sweet Oil Ref. Co., Wyman	2,000	.....	S	
Total	65,900	12,325		

MISSOURI

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Joplin Ref. Co., Joplin	500	*1,500	S-C	Jenkins
Standard Oil Co. (Ind.), Sugar Creek	23,700	16,500	S-C-A	Modified Holmes-Manley
Total	24,200	18,000		

*Shut down.

MONTANA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Arro Oil & Ref. Co., Lewistown	2,000	500	S-C	Dubbs
Big West Oil Co. of Mont., Kevin	1,200	1,000	S-C	Dubbs
Bridger Refinery, Bridger	90	.....	S	
Carroll, L. Ray, Roundup	50	.....	S	
Continental Oil Co., Lewistown	1,225	.....	S	
Cut Bank Ref. Co., Cut Bank	500	.....	S	
Deloraine Ref. Co., Oilmont	200	.....	S	
Gallatin Valley Co-Operative Co., Belgrade	350	.....	S	
Hart Refineries, Missoula	300	300	S-C	Own
Hole Bros. Ref., Cut Bank	300	.....	S	
Home Oil & Ref. Co., Great Falls	1,500	1,250	S-C	Dubbs
Home Oil & Ref. Co., Conrad	700	.....	S	
Hunt, Eugene, Winnett	400	.....	S	
Independent Ref. Co., Laurel	5,000	2,000	S-C-A	Dubbs
Northwest Ref. Co., Cut Bank	2,500	1,000	S-C	Dubbs
Snow Cap Oil Co., Sunburst	400	.....	S	
Texas Co. (International), Sunburst	5,500	4,000	S-C	DeFlorez
Unity Pet. Corp., Kalispell	800	.....	Comp.	
Yale Oil Corp. of S. Dak., Billings	5,000	.....	S-A	
Yale Oil Corp. of S. Dak., Kalispell*	1,000	.....	S	
Total	29,015	10,050		

*Building.

NEBRASKA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Carpenter, Terry, Scotts Bluff	750	.....	S	
Chadron Refinery, Chadron	100	.....	S	
Gordon Ref. Co., Rushville	100	.....	S	
Porter Oil Co., Sidney	300	.....	S	
Total	1,250			

NEW JERSEY

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Barber Co., Inc., Barber	10,000	3,000	A	Cross
Cities Service Asphalt Product Co., Warners	18,000	.....	S-A	
Cities Service Oil Co. of Pa., Petty's Island	12,000	7,000	S-C	Cities Service
Seaboard Ref. Co., Pescataway	6,500	.....	S	
Socony-Vacuum Oil Co., Inc., Paulsboro	23,000	4,100	Comp.	
Standard Oil Co. of N. J., Bayonne	54,000	.....	Comp.	
Standard Oil Co. of N. J., Linden	70,000	165,000	Comp.	Tube & Tank
Standard Oil Co. of N. J., Jersey City	....	.....	L	
Tide Water Associated Oil Co., Bayonne	55,000	21,000	Comp.	Tube & Tank
Total	248,500	200,100		

NEW MEXICO

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Aerex Co., The, Bloomfield	100	.....	S	
Basin Ref. Co., Aztec	100	.....	S	
Continental Oil Co., Albuquerque	625	.....	S	
Continental Oil Co., Farmington	750	.....	S	
Continental Oil Co., Artesia	1,500	640	S-C	Cross
McNutt Oil & Ref. Co., Brickland	1,500	500	S-C	Donnelly
Malco Refineries, Inc., Artesia	2,000	1,000	S-C	Dubbs
Pecos Diamond Ref. Co., Inc., Artesia	500	.....	S	
Universal Refineries, Inc., Artesia	1,000	.....	S	
Valley Ref. Co., Roswell	500	500	S-C	Dubbs
Total	8,575	2,640		

NEW YORK

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Allegany Refiners, Inc., Bolivar	1,500	.....	S	
Frontier Fuel Oil Corp., Tonawanda	2,000	.....	S	
Gulf Oil Corp., Staten Island	14,000	.....	S	
Sinclair Ref. Co., Wellsville	10,000	6,000	Comp.	Sinclair 600
Socony-Vacuum Oil Co., Inc., Brooklyn	19,000	3,150	Comp.	
Socony-Vacuum Oil Co., Inc., Buffalo	8,500	1,400	Comp.	
Socony-Vacuum Oil Co., Inc., Olean	6,500	650	Comp.	
Total	61,500	11,200		

OHIO

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Canfield Oil Co., Cleveland	1,500	.....	S	
Canton Ref. Co., Canton	2,000	1,200	S-C	Dubbs
Gulf Ref. Co., Toledo	18,000	9,000	S-C	Gulf
Gulf Ref. Co., Cincinnati	18,000	9,000	S-C	Gulf
Lima Crude Ref. Co., Findlay	700	.....	S	
National Ref. Co., Findlay	3,200	1,300	Comp.	Own
National Ref. Co., Marietta	700	.....	L-W	
Pure Oil Co., Heath	10,500	8,000	S-C	Gasoline Products
Pure Oil Co., Toledo	15,000	13,000	S-C	Cross and Gasoline Products

BRADFORD Oil Refining Company

is pleased with its NEW BENZOL-KETONE Dewaxing Plant

the 10th of its kind... *designed and built by* LUMMUS

1

The plant was completed exactly on contract schedule despite delays by some suppliers of equipment.

2

In zero weather, initial operations were smooth and continuous.

3

Neutrals of zero pour test ready for shipment on second day of initial operation.

4

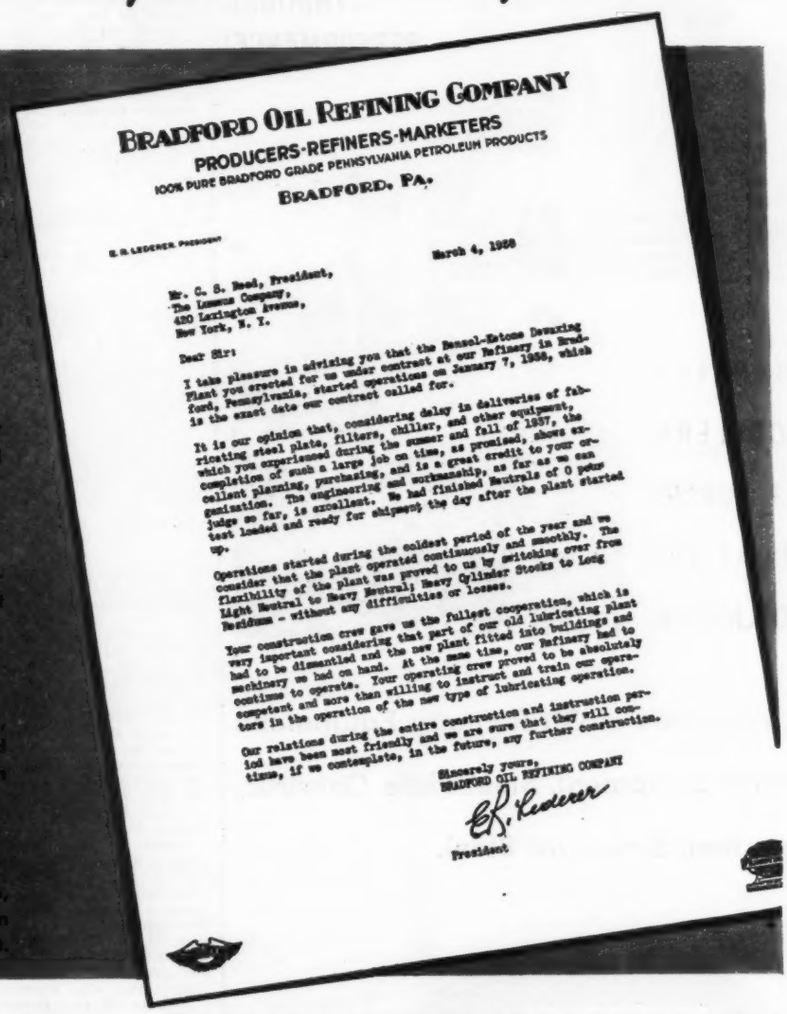
Stocks are changed frequently with facility, without slopovers.

5

Dewaxing plant installed, initial operations completed without interrupting operation of existing lube oil plant.

6

Engineering, workmanship, operating skill and instruction of staff by Lummus excellent.



BRADFORD OIL REFINING COMPANY
PRODUCERS-REFINERS-MARKETERS
100% PURE BRADFORD GRADE PENNSYLVANIA PETROLEUM PRODUCTS
BRADFORD, PA.

E. B. LEDERER, PRESIDENT

March 4, 1938

Mr. C. S. Reed, President,
The Lummus Company,
420 Lexington Avenue,
New York, N. Y.

Dear Sir:

I take pleasure in advising you that the Benzol-Ketone Dewaxing Plant you erected for us under contract at our Refinery in Bradford, Pennsylvania, started operations on January 7, 1938, which is the exact date our contract called for.

It is our opinion that, considering delay in deliveries of fabricating steel plate, filters, chiller, and other equipment, which you experienced during the summer and fall of 1937, the completion of such a large job on time, as promised, shows excellent planning, purchasing, and is a great credit to your organization. The engineering and workmanship, as far as we can judge so far, is excellent. We had finished Neutrals of 0 pour test loaded and ready for shipment the day after the plant started up.

Operations started during the coldest period of the year and we consider that the plant operated continuously and smoothly. The flexibility of the plant was proved to us by switching over from Light Neutral to Heavy Neutral; Heavy Cylinder Stocks to Long Residuum - without any difficulties or losses.

Your construction crew gave us the fullest cooperation, which is very important considering that part of our old lubricating plant had to be dismantled and the new plant fitted into buildings and machinery we had on hand. At the same time, our Refinery had to continue to operate. Your operating crew proved to be absolutely competent and more than willing to instruct and train our operators in the operation of the new type of lubricating operation.

Our relations during the entire construction and instruction period have been most friendly and we are sure that they will continue, if we contemplate, in the future, any further construction.

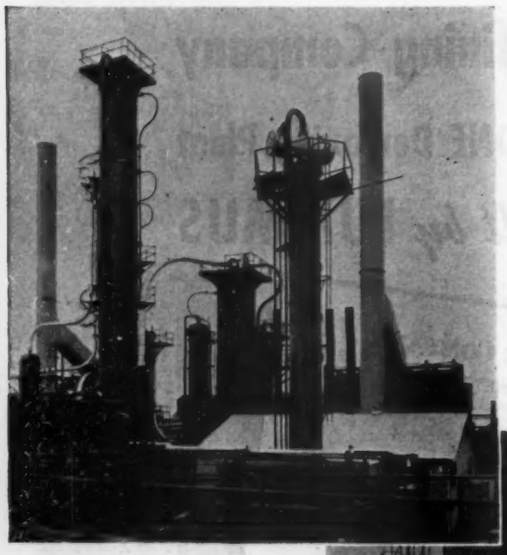
Sincerely yours,
BRADFORD OIL REFINING COMPANY
E. B. Lederer
President

THE LUMMUS COMPANY, 420 LEXINGTON AVENUE, NEW YORK, N. Y. • 411 WEST FIFTH STREET, LOS ANGELES, CAL. • BUSH HOUSE, ALDWYCH, LONDON, W. C. 2

LUMMUS

PETROLEUM REFINING PLANTS

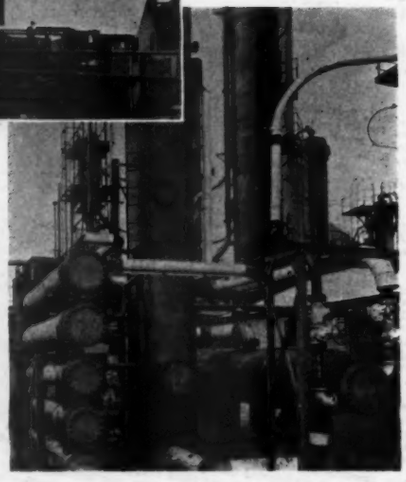
HEAT EXCHANGERS



TULSA TYPE

Specified

—THROUGH PERFORMANCE!



HEAT EXCHANGERS, REBOILER, COOLERS, AND BUBBLE TOWERS RECENTLY BUILT FOR REFINERY IN OKLAHOMA.

Qualified fabricators of Oil Refinery Equipment, Gasoline Plant Equipment, Steel Plate Construction, Structural Steel.

TULSA TYPE

Tulsa Boiler & Machinery Co.

OHIO (Continued)

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Standard Oil Co. (Ohio), Cleveland	21,000	12,500	Comp.	Tube & Tank
Standard Oil Co. (Ohio), Toledo	17,000	14,000	Comp.	Tube & Tank
Standard Oil Co. (Ohio), Lima	7,500	4,000	S-C	Solar
Sun Oil Co., Toledo	14,000	10,000	S-C	Own
Total	129,100	82,000		

OKLAHOMA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Anderson-Prichard Ref. Corp., Cyril	7,500	4,000	S-C-A	Winkler-Koch
Barnsdall Ref. Corp., Barnsdall	5,000	2,750	Comp.	Cross
Bell Oil & Gas Co., Granfield	5,000	2,500	S-C	Dubbs
Black Gold Ref. Co., Oklahoma City	2,500	1,250	S-C-L	Dubbs
Champlin Ref. Co., Enid	15,000	6,000	Comp.	Winkler-Koch
Cities Service Oil Co. (Del.), Okmulgee	4,000	1,200	Comp.	
Cities Service Oil Co. (Del), Ponca City	12,000	4,500	Comp.	Dubbs
Continental Oil Co., Ponca City	26,000	12,250	Comp.	Dubbs and Cross
Cosco Oil Co., Wynnewood	2,000	1,200	S-C-A	Dubbs
Cushing Ref. & Gaso. Co., Cushing	4,200	2,000	S-C	Dubbs
Deep Rock Oil Corp., Cushing	10,000	5,500	Comp.	Dubbs
Eason Oil Co., Enid	4,000	2,000	S-C	Jenkins
Johnson Oil Ref. Co., Cleveland	5,000	2,500	S-C	Dubbs
Knox Ref. Co., Covington	300	.....	S	
Mid-Continent Pet. Corp., West Tulsa	35,000	10,000	Comp.	Own
Ohio Oil Co., Bristow	5,000	1,500	S-C	Kellogg
Omar Ref. Co., Garber	5,000	2,500	S-C	Winkler-Koch
Peppers Gasoline Co., Oklahoma City	500	.....	S	
Phillips Pet. Co., Okmulgee	6,000	1,500	S-C-L	Dubbs
Pilgrim, Inc., Kingston	50	50	L	
Pure Oil Co., The, Muskogee	9,000	4,700	S-C	Cross and Gasoline Products
Rock Island Ref. Co., Beckett	6,500	4,000	S-C	Winkler-Koch
Sinclair Ref. Co., Sand Springs	6,000	3,000	Comp.	Cross
Sun Oil Co., Yale	5,000	.....	S	
Sunray Oil Co., Allen	7,000	3,500	S-C-A	Dubbs
Texas Co., West Tulsa	16,000	15,600	Comp.	Holmes-Manley, Pressure Coke
Tide Water Associated Oil Co., Drumright	12,000	7,000	S-C	Tube & Tank
Vinita Ref. Co., Vinita	140	.....	S	
Total	215,690	101,000		

PENNSYLVANIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Atlantic Ref. Co., Philadelphia	89,000	20,000	Comp.	Lewis, Cross, deFlorez, Comb.
Berry, James B., Sons Co., Inc., Oil City	2,500	450	Comp.	Dubbs
Bradford Oil Ref. Co., Bradford	2,700	900	Comp.	T.V.P.
Bradford Penn Ref. Corp., Clarendon	1,000	.....	Comp.	
Canfield Oil Co., Corapolis	1,500	.....	S-L	
Cities Service Oil Co. of Pa., Titusville	3,000	.....	S-L	Cities Service
Conewango Ref. Co., Warren	700	.....	L	
Continental Ref. Co., Oil City*	900	2,400	Comp.	Dubbs
Daugherty Refinery, Petrolia	2,000	...	L	
Freedom Oil Works, Freedom	2,500	500	Comp.	Dubbs
Franklin Creek Ref. Corp., Franklin	2,000	..	L	
Gulf Oil Corp., Philadelphia	33,000	20,000	Comp.	Gulf
Gulf Oil Corp., Pittsburgh	10,000	3,000	S-C	Gulf
Kendall Ref. Co., Bradford	4,000	2,200	Comp.	Dubbs
Oil Creek Ref. Co., Titusville	1,700	.....	Comp.	
Penna. Oil Prod. Ref. Co., Eldred	5,000	1,750	Comp.	Own
Pennsylvania Ref. Co., Karns City	2,000	.....	Comp.	
Pennsylvania Ref. Co., Titusville	2,000	.....	L	
Pennzoil Co., Rouseville	10,000	4,500	Comp.	
Pennzoil Co., Oil City*	....	5,000	S-C	Dubbs
Quaker State Oil Ref. Corp., Farmers Valley	3,000	1,250	Comp.	Dubbs
Quaker State Oil Ref. Corp., Emlenton	2,000	1,000	Comp.	Dubbs
Sinclair Ref. Co., Marcus Hook	40,000	30,000	S-C-A	Sinclair 600
Sherwood Pet. Co., Inc., Warren	800	.....	L-W	
Sloan & Zook Co., Warren	1,500	.....	L	
Starlight Ref. Co., Karns City	300	.....	L	
Sun Oil Co., Marcus Hook	70,000	65,000	Comp.	Own
Superior Oil Works, Warren	500	.....	S-L-W	
Ultra-Penn Ref. Co., Bruin	1,000	.....	S-L-W	
United Ref. Co., Warren	4,000	2,200	Comp.	Dubbs
Valvoline Oil Co., Butler	3,000	.....	L-W	
Warr-Penn Ref. Co., Warren	1,500	.....	L	
Waverly Oil Works Co., Pittsburgh	1,500	600	Comp.	Cross
Wolverine-Empire Ref. Co., Reno	2,500	600	Comp.	Dubbs
Total	307,100	161,350		

*Cracking plant jointly owned by Pennzoil Co., James B. Berry Sons Co., Inc., Wolverine-Empire Refining Co., Inc., and Continental Refining Co.

RHODE ISLAND

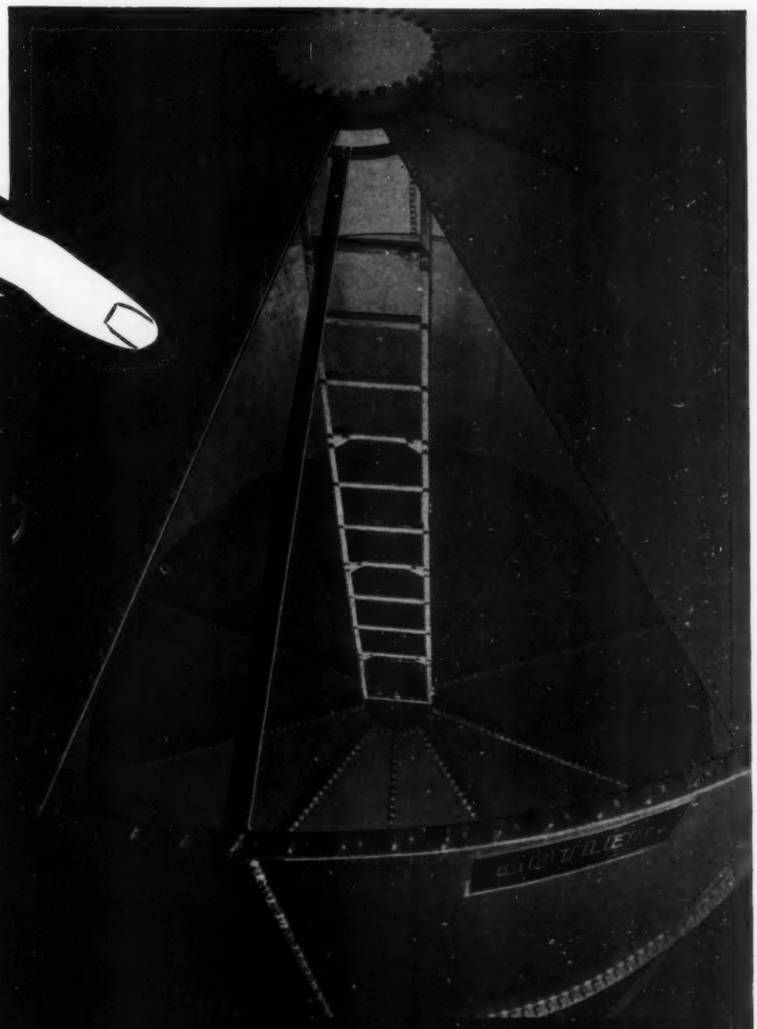
Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Socony-Vacuum Oil Co., Inc., Providence	9,000	1,650	S-C-A	
Texas Co., Providence	2,000	.....	S	
Total	11,000	1,650		

SOUTH DAKOTA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Hot Springs Ref. Co., Hot Springs	160	.....	S	
Rex Oil Refinery, Inc., Rapid City	200	.....	S	
Sturgis Ref. Co., Sturgis	50	.....	S	
Total	410			

HERE'S HOW...

BUTLER BOLTED TANKS ARE MADE STRONGER TO LAST LONGER



The Butler Bolted Tank above is not upside down. The candid camera looked straight down from top to bottom. Both the decks and bottoms of Butler Bolted Tanks are assembled from precision formed and punched triangular segments. The extra strength of generously lapped, channel steel reinforced seams, uniformly spaced, is distributed evenly over deck and bottom areas and contributes greatly to the overall structural strength of the tanks.

Heavy angle steel deck rafters, center supported on heavy, gusseted steel ladder tied to the tank bottom are other extra strength features which the candid camera reveals. The bolts in all seams are heat treated with plenty of high tensile strength to draw and hold tight seams without stripping threads or twisting off heads.

GALVANIZED OR TNEMECIZED

FOR SOUR CRUDE AND SALT WATER CONDITIONS

Butler Bolted Tanks, made of a SPECIAL GALVANIZED STEEL which has been developed for this particular service, are now available.

Or regular, blue annealed, copper steel tanks are given a prime coat of Tnemecizing at the factory and final Tnemecizing by authorized Tnemecizers in the field after erection.

In Butler Bolted Tanks you get the surest corrosive crude and salt water protection.

Any of the many Butler Field Service organizations will be glad to show you how the new, improved Butler Construction makes tanks stronger to last longer. Inquiries regarding the new Butler Tanks and location of stocks are invited. Night and day field service is available to all oil fields.

BUTLER MANUFACTURING COMPANY

13TH & EASTERN AVE. KANSAS CITY, MISSOURI

SOUTH CAROLINA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Standard Oil Co. of N. J., Charleston	5,000	.....	S-A	

TENNESSEE

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Russell Prod. Co., The, Sunbright	200	.....	Comp.	

TEXAS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Aero Gas Ref. Co., Fort Stockton	350	.....	S	
Alpine Ref. Corp., Houston	3,500	.....	S	
American Pet. Co. of Texas, Houston	10,000	.....	S	
Amsco Ref. Co., Mirando City	3,500	1,000	Comp.	Donnelly
Amsco Ref. Co., Corpus Christi	10,200	.....	S	
Atlantic Ref. Co., Atreco (Port Arthur)	18,000	6,000	S-C	Comb.
Baird Ref. Co., Baird	2,000	1,400	Comp.	Own
Barnsdall Ref. Corp., Corpus Christi	5,000	5,000	S-C	Dubbs
Cascade Ref. Co., Reeds Switch (Kilgore)	2,000	1,100	S-C	
Clay Ref. Co., Arp	3,500	1,000	S-C	Own
Coastal Refineries, Inc., Port Isabel	5,000	.....	S	
Coleman Ref. Co., Coleman	500	.....	S	
Col-Tex Ref. Co., Colorado	12,000	3,700	S-C-A	Dubbs
Concho Ref. Co., San Angelo	250	.....	S	
Continental Oil Co., Wichita Falls	4,000	2,200	S-C	Cross
Corpus Christi Ref. Corp., Corpus Christi	7,500	.....	S	
Cosden Pet. Corp., Big Spring	15,000	10,000	Comp.	Dubbs
Crown Central Pet. Corp., Houston	15,000	7,500	S-C-L	Holmes-Manley
Danciger Oil & Refineries, Inc., Pampa	6,000	4,000	S-C	Biddison-Boyd
Danciger Oil & Refineries, Inc., Longview	6,000	4,000	S-C	Biddison-Boyd
Danube Oil Corp., Borger	400	.....	S	
Denver Prod. & Ref. Co., Gainesville	3,000	.....	S	
Eastern States Pet. Co., Houston	15,000	10,000	S-C	Gaso. Products
East Texas Ref. Co., Longview	10,000	5,000	Comp.	Donnelly
Eggleston Oil Prod. Co., Three Rivers	1,000	.....	S-L-A	
Falls Ref. Co., Wichita Falls	2,500	.....	S	
Farmers Refinery, The, Lubbock	500	.....	S	
Gratex Ref. & Fuel Oil Co., Graham	500	.....	S	
Gulf Oil Corp., Port Arthur	110,000	50,000	Comp.	Gulf
Gulf Oil Corp., Fort Worth	6,000	3,000	S-C	Gulf
Gulf Oil Corp., Sweetwater	5,000	2,500	S-C	Gulf
Hightower Oil & Ref. Corp., Brownwood	750	.....	S	
Houston Oil Co. of Tex., Viola	1,000	500	S-C	Dubbs
Howard County Ref. Co., Big Spring	2,000	.....	S	
Humble Oil & Ref. Co., Baytown	150,000	84,000	Comp.	Cross, Tube & Tank
Humble Oil & Ref. Co., Ingleside	20,000	15,000	S-C	Tube & Tank
Humble Oil & Ref. Co., South San Antonio	5,000	.....	S	
Humble Oil & Ref. Co., Neches	5,000	.....	S	
Hurricane Pet. Corp., Overton	5,000	3,000	S-C	Own

TEXAS (Continued)

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Hurricane Pet. Corp., Arp	3,300	2,500	S-C	Donnelly
Jacksboro Ref. Co., Jacksboro	250	.....	S	
Kraco Ref. Co., Bryson	2,000	.....	S	
Lacy, R., Refinery, Kilgore	3,000	1,700	S-C	Vapor Phase
LaSalle Pet. Co., Burkburnett	3,000	.....	S	
Magnolia Pet. Corp., Beaumont	110,000	45,000	Comp.	Cross
Magnolia Pet. Corp., Fort Worth	5,500	3,000	S-C	Cross
Magnolia Pet. Corp., Corsicana	4,000	.....	S	
Magnolia Pet. Corp., Luling	6,800	5,800	S-C	Control Coil
Martin Ref. Co., Gladewater	3,000	.....	S	
Midway Ref. Co., Goldsboro	300	.....	S	
Moutray Oil Co., Hawley	1,200	.....	S	
Muenster Ref. Co., Muenster	300	.....	S	
North Texas Oil & Ref. Co., Gainesville	600	.....	S	
Ohio Oil Co., Fort Worth	5,000	1,500	Comp.	Kellogg
Olney Oil & Ref. Co., North Olney	3,000	1,500	S-C	Donnelly
Onyx Ref. Corp., Abilene	2,000	.....	S	
Paluxy Asphalt Co., Talco	5,000	1,500	S-C-A	Own
Pan American Ref. Corp., Texas City	79,000	79,000	Comp.	Kellogg Comb.
Panhandle Ref. Co., Wichita Falls	4,200	2,500	S-C	Dubbs
Panhandle Ref. Co., Kings Mill	2,500	.....	S	
Panhandle Ref. Co., Lueders	1,500	1,000	S-C	Dubbs
Payward Ref. Co., Shamrock	600	.....	S	
Pettus Oil & Ref. Co., Pettus	1,000	.....	S	
Pettus Oil & Ref. Co., Mathis	1,000	.....	S	
Phillips Pet. Co., Borger	35,000	17,000	S-C	Own
Phoenix Ref. Co., Pettus	1,000	.....	S	
Phoenix Ref. Co., San Antonio	1,200	.....	S	
Pioneer Oil & Ref. Co., Somerset	2,000	.....	S-L	
Pontiac Ref. Corp., Corpus Christi	7,000	.....	S	
Post Ref. Co., Rotan	800	.....	S	
Premier Oil & Ref. Co. of Tex., Longview	4,000	3,000	S-C	
Pure Oil Co., Smiths Bluff (P.O., Nederland)	38,000	29,000	S-C	Cross and Gasoline Products
Rado Ref. Co., McAllen	800	.....	S	
Refugio Refinery, Refugio	1,500	.....	S	
Refugio Refinery, Edinburg	1,500	.....	S	
Republic Oil Ref. Co., Texas City	5,000	5,000	S-C	Winkler-Koch
San Antonio Ref. Co., Southton	100	.....	S	
Shamrock Oil & Gas Corp., Sunray	3,000	3,000	S-C	Dubbs
Shamrock Oil & Gas Corp., LeFors	1,500	.....	S	
Shell Pet. Corp., Houston	74,000	52,000	S-C	Dubbs
Shelly Ref. Co., Bay City	1,000	600	S-C	Own
Sinclair Ref. Co., Fort Worth	4,000	3,000	S-C	Sinclair 600
Sinclair Ref. Co., Gladewater	4,000	.....	S	
Sinclair Ref. Co., Houston	55,000	44,000	S-C-L	Sinclair 600
Solvex Refineries, Inc., Gladewater	5,000	2,000	S-C	Dubbs
Southland Ref. Co., Olney	500	.....	S	
Southport Pet. Co., Texas City	20,000	10,000	S-C	Donnelly
Southport Pet. Co., Kilgore	4,000	4,000	S-C	Own
Southwestern Oil & Ref. Co., Corpus Christi	6,000	.....	S	
Stamford Ref. Co., Stamford	400	.....	S	

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TEXAS (Continued)

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Standard Oil Co. of Tex., El Paso	14,000	5,000	S-C	Dubbs
Starlight Ref. Co., Ballinger	1,000	.....	S	
Stone Oil Co., Texas City	7,500	.....	S	
Talco Asphalt & Ref. Co., Mount Pleasant	7,000	.....	S-C-A	Dubbs
Taylor Ref. Co., Taylor	1,000	.....	S	
Terminal Ref. Corp., Corpus Christi	6,000	.....	S	
Texas Co., Port Arthur	115,000	96,000	Comp.	Holmes-Manley, deFlorez Pressure Coke
Texas Co., Neches	25,000	.....	S-A	
Texas Co., Houston	23,000	2,500	S-C	Tube & Tank
Texas Co., West Dallas	16,000	13,000	S-C	Holmes-Manley deFlorez Pressure Coke
Texas Co., San Antonio	5,000	5,000	S-C	Holmes-Manley
Texas Co., El Paso	2,000	2,000	S-C	Holmes-Manley
Texas Co., Amarillo	6,000	4,000	S-C	deFlorez Pressure Coke
Texas Pacific Coal & Oil Co., Caddo	600	.....	S	
Tucker Oil Co., Burkburnett	250	.....	S	
Tydal Ref. Co., Gainesville	2,000	.....	S	
Valley Ref. Co., Harlingen	1,000	.....	S	
Waggoner Ref. Co., Electra	6,000	3,000	Comp.	Dubbs
Western Ref. Co., Fort Stockton	1,000	.....	S	
West Texas Ref. Co., Pecos	500	.....	S	
Wickett Ref. Co., Wickett	3,500	.....	S	
Wood-Moore Corp., Port Lavaca	1,500	.....	S-L	
Total	1,241,150	668,000		

UTAH

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Utah Oil Ref. Co., Salt Lake City	6,500	7,000	Comp.	Modified Holmes-Manley
Wasatch Oil Ref. Co., Woods Cross	1,500	1,000	S-C	Vapor Phase
Total	8,000	8,000		

VIRGINIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Texas Co., Norfolk	2,000	.....	S	

WEST VIRGINIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Carbide & Carbon Chemicals Corp., South Charleston	2,000	2,000	C	Gyro
Elk Ref. Co., Falling Rock	2,500	1,200	Comp.	Dubbs
Pure Oil Co., Cabin Creek	4,000	2,500	Comp.	Gyro
Quaker State Oil Ref. Corp., St. Marys	2,000	1,000	Comp.	Dubbs
Total	10,500	6,700		

WYOMING

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Beck, G. T., Ref., Cody	500	.....	S-A	
Bay Pet. Corp., Cheyenne	1,500	.....	S	
C. & H. Refinery, Lusk	200	.....	S	
Consumers Oil & Ref. Co., Newcastle	1,000	.....	S	
Continental Oil Co., Glenrock	2,800	1,800	S-C	Cross
Crook County Refinery, Sundance	50	.....	S	
Elk Horn Gas Refinery, Osage	55	.....	S	
Gillette Ref. Co., Gillette	300	.....	S	
Gray Refining, Inc., Newcastle	350	.....	S	
Mission Oil Co., Thermopolis	1,500	.....	S-A	
Moorcroft Ref. Co., Inc., Moorcroft	65	.....	S	
Northwestern Petroleum, Osage	100	.....	S	
Ohio Oil Co., Lovell	2,500	.....	S	
Oreana Ref. Co., LaBarge	80	.....	S	
Pilot Butte Oil Co., Morton	100	.....	S	
Resolute Oil Corp., Badger Basin	800	.....	S	
Salt Creek Ref. Co., Columbine	70	.....	S	
Sinclair Ref. Co., Parco	8,000	7,000	S-C	
Socony-Vacuum Oil Co., Inc. (White Eagle), Casper	3,000	3,000	S-C-A	Own
Standard Oil Co. (Ind.), Casper	12,600	6,500	Comp.	Vapor Phase (Kellogg)
Standard Oil Co. (Ind.), Greybull	4,000	1,900	S-C-A	Cross
Texas Co., Casper	7,000	7,200	S-C	Holmes-Manley Pressure Coke
Texas Co., Cody	3,000	.....	S-C	
Texas Co. (Calif. Pet.), Calpet	300	.....	S	
Wyoming Gas & Oil Co., Osage	750	1,000	S-C	Own
Yale Oil Corp. of S. Dak., Lovell	1,000	.....	S-A	
Yale Oil Corp. of S. Dak., Worland	600	.....	S	
Total	52,220	28,400		

Shutdown Plants in United States

ARKANSAS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Houston Oil Co. of Texas, Camden	5,500	2,000	S-C	Dubbs

CALIFORNIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
B. & T. Ref. Co., Hynes	1,000	.....	S	
California Oil & Ref. Co., Seal Beach	2,500	.....	S	
Cameron, J. D., Taft	350	.....	S	
Cole Ref. Co., Seal Beach	2,500	.....	S	
Eden Ref. Co., Huntington Beach	1,500	.....	A	
Kolingo Ref. Co., Coalinga	300	.....	L	
Peckham Oil Ref., Inc., Long Beach	2,000	.....	S	
Producers Ref. Co., Long Beach	1,200	.....	S	
Redondo Oil & Ref. Co., Torrance	1,000	.....	S	
Rice Ranch Oil Co., Orcutt	500	500	S-C-A	Clark
Richfield Oil Corp., Bakersfield	2,000	.....	S	
Ring Oil Co., Ltd., Seal Beach	1,000	.....	S	
Roath Ref. Co., Long Beach	2,500	.....	S	
Stockton Oil Co., Inc., Stockton	2,500	.....	S	
Texas Co., The, Coalinga	500	.....	S	
Union Oil Co. of Calif., Avila	10,000	.....	S	
Total	31,350	500		

COLORADO

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Berthoud Refinery, Berthoud	100	.....	S	
McGarr Pet. Corp., Kline	180	.....	S	
Midland Oil Ref. Co., Denver	1,000	.....	S	
Total	1,280			

ILLINOIS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Cross, Henry H., Co., Joliet	2,000	.....	S	

KANSAS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Chase Ref. Co., Chase	800	.....	S	
Cusco Oil & Ref. Co., The, Chase	3,500	.....	S	
Golden Rule Oil Co., North Wichita	1,000	500	S-C	Jenkins
Workman Oil & Ref. Co., McCune	45	.....	S	
Total	5,345	500		

KENTUCKY

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Bowling Green Ref. Co., Inc., Memphis Junction	1,500	.....	S	
Central Oil Co., Glasgow	250	.....	S	
Simrall Ref. Corp., Horse Cave	2,600	.....	S	
Total	4,350			

LOUISIANA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Shoreline Oil Co., Shoreline	5,000	2,200	Comp.	

MICHIGAN

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
American Petro-Chemical Co., Wayne	1,200	500	S-C	Own
Cryden Refineries, Inc., Drayton Plains	1,800	.....	S	
Pentagon Ref. Co., Plymouth	2,500	.....	S	
Total	5,500	500		

MONTANA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Bears Den Refinery, Chester	50	.....	S	
Dunlap Refinery, Cat Creek	75	.....	S	
Hart Refineries, Hedgesville	100	.....	S	
Hawley, Ted, Gallup City	50	.....	S	
Independent Ref. Co., Billings	1,500	.....	S	
Independent Ref. Co., Butte	1,000	.....	S	
Unity Pet. Corp., Havre	500	.....	S	
Yale Oil Corp. of S. Dak., Miles City	500	.....	S	
Total	3,775			

NEBRASKA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Midland Ref. Corp., Crawford	75	.....	S	

OHIO

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Johnson, A. L., Wayne	60	.....	S	
Montgomery, H. A., Co., Inc., Findlay	500	.....	S-L-A	
Peninsula Oil, The, Port Clinton	30	.....	S	
Total	590			

OKLAHOMA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Barnsdall Ref. Corp., Okmulgee	7,500	3,000	S-C	Cross
Crump Refinery, Oklahoma City	2,000	.....	S	
Cushing Ref. & Gaso. Co., Blackwell	1,700	.....	S	
Electrol Ref. Co., Oklahoma City	2,000	.....	S	

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OKLAHOMA (Continued)

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Franklin, Wirt, Pet. Corp., Ardmore	4,000	.....	S	
Globe Oil & Ref. Co., Blackwell	8,000	4,000	S-C	Winkler-Koch
Illinois Oil Co., Cushing	3,000	1,500	S-C	Donnelly
Monarch Ref. Co., Oklahoma City	1,200	.....	S	
Sooner State Oil & Gas Co., Oklahoma City	500	.....	S	
State Ref. Co., Oklahoma City	800	.....	S	
Wilcox, H. F., Oil & Gas Co., Bristow	6,000	1,500	S-C	Dubbs
Total	36,700	10,000		

PENNSYLVANIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Pure Oil Co., Marcus Hook	14,000	9,000	Comp.	Cross and Gyro
Tiona Ref. Co., Clarendon	1,000	.....	L-W	
Valvoline Oil Co., Warren	1,000	.....	L-W	
Total	16,000	9,000		

TEXAS

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Allstate Ref. Co., Thrall	2,500	.....	S	
Alto Ref. Co., Clarkwood	250	.....	S	
Atlantic-Pacific & Gulf Ref. Co., Wichita Falls	3,000	1,000	S-C	Jenkins
Beacon Oil & Ref. Co., Henderson	4,500	.....	S	
Benavides Ref. Co., Benavides	1,200	.....	S	
Bryson Ref. Co., Bryson	600	.....	S	
Carle Ref. Co., San Antonio	1,000	.....	S	
Carson, M. D., Ref. Co., Brady	150	.....	S	
Citizens Oil & Ref. Corp., Luling	500	.....	S	
Crown Oil Co., Fort Worth	2,000	.....	S	
Davis Refinery, Inc., Corpus Christi	1,000	.....	S	
Deep Sand Oil Co., Reeds	3,500	.....	S	
DeLuxe Reclamation Plant, Corsicana	1,000	.....	S	
Exchange Pet. Corp., Albany	800	.....	S	
General American Oil Co., Gladewater	4,000	1,500	S-C	Own
General American Oil Co., Overton	5,500	2,000	S-C	Own
Graham Ref. Co., Graham	500	.....	S	
Hill Ref. Co., Ballinger	40	.....	S	
Ina Oil & Ref. Co., Hondo	400	.....	S-L	
Intersouthern Ref. Co., Laredo	2,000	.....	S	
K. D. Ref. Co., Talco	3,000	.....	S	
Kent Ref. Co., Angus	4,000	.....	S	
McMurrey Pet. Corp., Tyler	10,000	3,000	S-C	Dubbs
Macmillan Pet. Corp., Borger	7,500	.....	S	
Master Pet. Co., Waco	1,000	.....	S	
Mertzon Ref. Co., Mertzon	200	.....	S	
Minerva Ref. Co., Minerva	1,000	.....	S	
Norgold Ref. Co., Olney	1,000	.....	S	
Nortex Ref. Co., Newcastle	100	.....	S	
Overton Ref. Co., Inc., Overton	3,000	.....	S	
Paramount Refineries, Inc., San Angelo	2,000	.....	S	
Pilot Point Ref. Co., Pilot Point	700	.....	S	
Plainview Ref. Co., Plainview	800	.....	S	
Rusk Oil & Ref. Co., Overton	4,000	.....	S	
Sunshine Refinery, Livingston	125	.....	S	
Taxman Ref. Co., Wichita Falls	3,000	1,500	S-C	Donnelly
Tower Ref. Co., Overton	3,500	1,000	S-C	
Trinity Ref. Co., Gladewater	3,000	.....	S	
Utah Ref. Co., Kilgore	2,000	.....	S	
West Texas Oil & Ref. Co., Sweetwater	100	.....	L	
White Wing Ref. Co., Inc., Sullivan City	1,000	.....	S	
Yuba Oil Co., Inc., Nacogdoches	150	.....	S	
Total	85,715	10,000		

UTAH

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Diamond Oil Co., Virgin	200	.....	S	
Utah Parks Pet. Co., Virgin	100	.....	S	
Total	300			

WEST VIRGINIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Tri-State Ref. Co., Kenova	2,500	1,800	S-C	Jenkins

WYOMING

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Fern Oil Co., Thermopolis	500	.....	S	
Gillette Ref. Co., Sheridan	300	.....	S	
Goshen Oil & Ref. Co., Torrington	250	.....	S	
Park Ref. Co., Cody	1,600	.....	S	
Pedro Refinery, Newcastle	300	.....	S	
Wheatland Ref. Co., Wheatland	120	.....	S	
Whitman, A. J., Leroy	200	.....	S	
Total	3,270			

Refineries in Canada

ALBERTA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Bell Ref. Co., Ltd., Calgary	750	.....	S	
British American Oil Co., Ltd., Coutts*	2,500	1,200	C-S	Dubbs

ALBERTA (Continued)

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Fraser, J. W., Ref. Co., Wainwright	100	.....	S	
Gas & Oil Prod., Ltd., Hartell	1,000	.....	S	
Gold Standard Oils, Ltd., Wainwright	300	.....	S	
Imperial Oil, Ltd., Calgary	5,500	4,400	S-C-A	Tube & Tank
Lion Ref. Co., Calgary	750	.....	S	
Oughton Bros., Turner Valley	100	.....	S	
Total	11,000	5,600		

*Shut down.

BRITISH COLUMBIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Imperial Oil, Ltd., Ioco	16,000	6,800	S-C-L-A	Tube & Tank
Shell Oil Co. of British Columbia, Ltd., Shellburn	4,500	.....	S	
Standard Oil Co. of British Columbia, Ltd., Burnaby	2,000	.....	S	
Vancouver Oil Co., (Home Oil Dist., Ltd.), North Vancouver	1,000	.....	S	
Total	23,500	6,800		

MANITOBA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Mid-West Refineries, Ltd., Dauphin	200	.....	S	
North Star Oil, Ltd., Winnipeg	800	.....	S	
Radio Oil Refineries, Ltd., Winnipeg	1,200	.....	S	
Total	2,200			

NOVA SCOTIA

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Imperial Oil., Ltd., Halifax	17,000	8,300	S-C-A	Tube & Tank

ONTARIO

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
British American Oil Co., Ltd., Toronto	6,000	3,000	C-S	Dubbs and Cross
Burlington Refineries, Ltd., Hamilton*	600	.....	S	
Canadian Oil Companies, Ltd., Petrolia	2,500	1,000	S-C	Liquid Phase
Good Rich Ref. Co., Ltd., Port Credit	2,000	700	S-C	Dubbs
Imperial Oil, Ltd., Sarnia	22,000	15,600	Comp.	Tube & Tank
McColl-Frontenac Oil Co., Ltd., Toronto*	5,000	3,000	C-S	Gyro and Jenkins
Total	38,100	23,300		

*Shut down.

QUEBEC

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
British American Oil Co., Ltd., Montreal	16,200	8,100	Comp.	Winkler-Koch
Champlin Oil Products, Ltd., Montreal, East	2,500	.....	S	
Imperial Oil, Ltd., Montreal	30,000	9,000	S-C-A-L	Tube & Tank
McColl-Frontenac Oil Co., Ltd., Montreal	22,000	13,000	S-C	Gasoline Products and Jenkins
Shell Oil Co. of Canada, Ltd., Montreal	8,000	6,000	S-C	Dubbs Combination
Total	78,700	36,100		

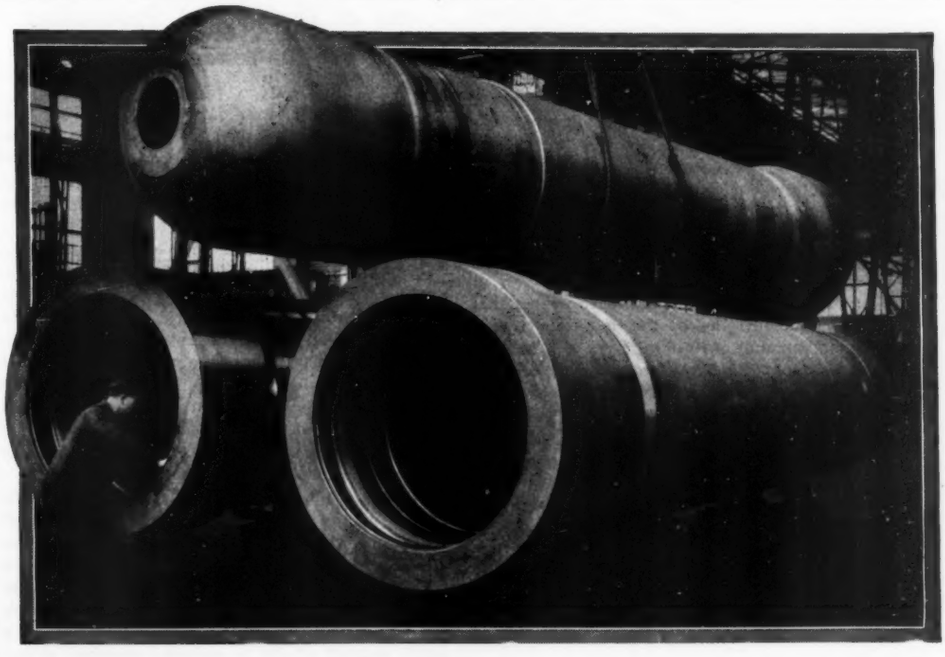
SASKATCHEWAN

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
British American Oil Co., Ltd., Moose Jaw	4,000	2,000	Comp.	Winkler-Koch
Consumers' Co-Operative Refineries, Ltd., Regina	600	.....	S	
Eston Refining Co., Ltd., Eston	300	.....	S	
Hi-Way Refineries, Ltd., Regina	700	350	S-C	Baize
Hi-Way Refineries, Ltd., Moose Jaw	275	.....	S	
Hi-Way Refineries, Ltd., Rosetown	275	.....	S	
Hi-Way Refineries, Ltd., Swift-Current	275	.....	S	
Hi-Way Refineries, Ltd., Saskatoon	275	.....	S	
Hi-Way Refineries, Ltd., Prince Albert	275	.....	S	
Hi-Way Refineries, Ltd., Weyburn	275	.....	S	
Home Oil & Ref. Co., Ltd., Humboldt	300	.....	S	
Imperial Oil, Ltd., Regina	4,500	3,850	S-C-A	Tube & Tank
Northern Pet. Corp., Ltd., Kamsack	200	.....	S	
Soo Refinery, Ltd., Weyburn*	150	.....	S	
Total	12,400	6,200		

*Shut down.

Refineries in Mexico

Company and plant location—	Crude oil cap.	Cracking cap.	Type of refinery	Type of cracking plant
Compania Mexican de Petroleo "El Aguila" S.A., Tampico, Vera Cruz	50,000	4,200	S-C-A	
Compania Mexican de Petroleo "El Aguila" S.A., Minatitlan, Vera Cruz	33,000	1,200	S-C-A	
Compania Mexican de Petroleo "El Aguila" S.A., Mexico City	12,000	.....	S-A	
Huasteca Pet. Co., Tampico	20,000	6,500	Comp.	Own
Petroleos de Mexico, S.A., Tampico, Tamps	3,000	1,000	S	Dubbs
Pierce Oil Co., S.A., Tampico, Tamps	16,000	.....	Comp.	
Total	134,000	12,900		



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Well Treatment After Perforating

By BRUCE BARKIS
Lane-Wells Co., Los Angeles, Calif.

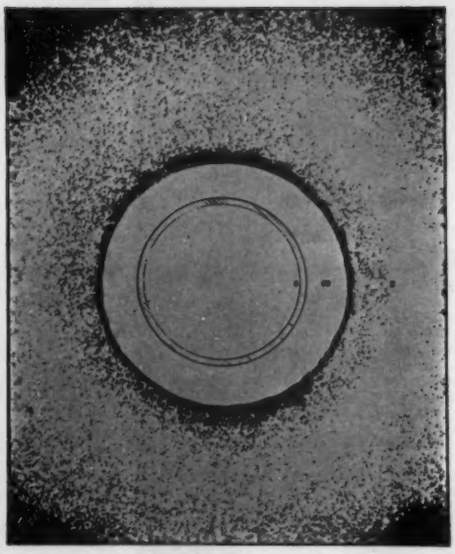

Fig. 1.—Cross sectional plan of cased-off productive sand. (C—casing, CG—cement grout, M—mud sheath, S—oil sand with infiltrated water in pore space.)

A.P.I.—Before Spring Meeting of Division of Production, Fort Worth, Texas, March 24-25

The progress that has been made in production technique has been accomplished through a clearer understanding of the mechanical efficiency of production equipment, of actual bottom-hole measurements and of the physical laws that govern the flow of oil and gas through the producing zone. Discussions with field and engineering production personnel indicate that no comprehensive study has been made of the conditions adverse to the free passage of oil through the area adjacent to the perforated casing and through the openings themselves. This applies to new zones that have been cased off and which are to be tested for production, as well as to zones that have been producing but show the need for remedial work to stimulate or revive production.

Well records covering the number of casing strings, their kind, weight and depth, whether blank or perforated, and the condition of the casing, should be readily available, and will determine the perforating specifications.

The only factor influencing perforating that usually can be controlled by the field personnel is the kind and amount of fluid in the hole. The opinion expressed by H. E. Winter[1] that "the fluid should be 500 to 1,500 feet lower than the expected fluid level in order to let the incoming fluid clean the smaller perforations" has been generally followed in field practice. A further study of the conditions within the zone, correlated with the treatment that this study indicates should be used subsequent to perforating, will give more definite information on the kind and amount of fluid that should be left in the well.

In a well where casing has been cemented through a productive zone (see Figure 1) and is to be perforated, the natural zone characteristics, including the type of oil, amount of gas, formation pressure, permeability, porosity, grain size, shear and water content, may be known.

The sealing action of mud fluid and its possible penetration into the productive zone along with the drilling water which has filtered through the mud sheath has been studied extensively, and the results of this study have been published. Recent investigation of the effect of water filtration through the mud cake and into the pore spaces of the sand and the consequent reduction in permeability of these sands is covered in an article by Larsen[2] in which the capillary behavior of water-oil mixtures is discussed.

In placing the cement behind the casing, the scouring action has been recognized, although we do not know the thickness of the mud film left on the sand face. The effect of the natural formation temperature and the heat of crystallization of the cement on this film and on the mud fluid in the pore space of the sand is to cause a further obstruction. Moreover, it has been pointed out by C. P. Bowie[3] that "where wells have been drilled through oil-producing formations of low differential pressure, a sheath of mud cake has been formed between the casing and the surface of the formation, which after a time becomes as hard and as impervious to the passage of oil as the cap rock that holds the oil and gas in place in the structure. Actually, the clay in the drilling fluid, which later becomes a mud cake behind the casing, was a pulverized part of that cap rock or some similar material."

Remedial measures taken to stimulate or bring back production in an old producing well will generally have to overcome even more adverse subsurface conditions. The natural zone characteristics, as outlined above, will have been reflected in the production history of the well. The method of originally completing the well will indicate whether mud and other contaminating material has been completely removed from the slot openings, and extending laterally into the formation where the natural sand conditions obtain.

The condition of the formation beyond the face may be in the condition indicated in Figure 2. It will probably be in a more aggravated form than when the formation has been encased and cemented. In a paper delivered by H. E. Winter,[4] the theory was expressed that "as the well is produced, the oil moving toward the hole carries with it a small amount of silt or colloidal material which may tend to accumulate in the pores of the sand and clog the sand. This clogging action may also be aggravated by the waxing or sludging effect of certain types of oils. In effect this may form a ring of impervious material around the well. This action might take place several feet back from the perforations, so that no amount of perforation washing will do any good. If certain salt waters are being produced with the oil, the condition may be further aggravated by chemical action or deposition of salts. Just how this trouble may be overcome is not apparent as yet, although some washback action with the proper fluids or chemicals may open up the passage for the oil."

The ability of the formation to retain its original wall depends principally on shear and the pressure drop at the sand face. Even though the original hole diameter is retained, restriction to flow caused by cavings, sand bridging and contaminating material mentioned above may result with a marked decline in production. Where the original hole diameter is not retained, the restriction to flow is even more pronounced.

Penetration.—Extensive field experience and laboratory tests have developed the factors such as gun design, bullet design, and the kind and amount of powder that provide satisfaetory penetration. Uniform penetrative energy is insured by accurate measurement of powder, maintenance of barrel tolerances and precautions to prevent wetting of the powder charge.

Surface penetration tests have conclusively developed the comparative effect of variations of these factors, and while several penetration tests made in wells have shown that double strings of casing cemented together can be perforated, no series of tests have been made under simulated well conditions to determine the penetration of the bullet into various formations.

Drainage opening.—If there were no further restriction to flow of oil through perforations than the pressure drop caused in the perforation itself, it would be a simple matter to calculate the number

Fig. 2—Cross sectional plan through producing sand

[1] "Reconditioning Procedure with Portable Equipment," read before the A.P.I. Pacific Coast district meeting at Los Angeles, Calif., on April 13, 1937. Reproduced in full in "Drilling and Production Practice—1937."

[2] "Loss of Water to Oil-Bearing Formations as a Basic Cause of Low Production," Drilling Mud, April 1937.

[3] U. S. Bureau of Mines Report of Investigations No. 3384, "Hardening of Mud Sheaths in Contact with Oil."

[4] Op. cit.

of perforations required. The area of various average openings in relation to pipe area and wall face is shown in Figure 3, and the small percentage of drainage opening in relation to pipe area is evident.

Considering the many adverse conditions which may obtain behind the casing, on the face of the formation, in the formation itself and even in the slot openings (all of which have been previously discussed) it has been common practice to use more openings than might be theoretically required. The advantages of providing ample drainage openings are to decrease the restriction to flow, prolong the interval between treatment, to simplify the treatment method and provide a better opportunity to remove the material obstructing free entry of the oil.

Treatment Methods

Well-treatment methods are primarily of the mechanical, hydraulic and chemical type. The mechanical cleaners include perforation scrapers and bailers for removal of material from the bottom of the oil string. The hydraulic methods depend on pressure differential opposite the zone to be cleaned, while the chemical methods involve the breaking down or dissolving of the interfering material.

Hydraulic cleaners.—When our customary completion practices are analyzed, including washing, swabbing, circulation with oil, so-called pressure-drilling and subcirculation methods, it is evident that the harmful effect of mud fluid and water in sealing and restricting the free passage of oil through the sand pores, annular space and the openings themselves, is of principal concern.

Whether or not these methods are adequate, the advisability of removing all of the mud fluid and water cannot be questioned and the hydraulic cleaning methods have been the ones principally used for this purpose. These methods depend on differential pressure to utilize formation pressure or pump pressure to open the perforation. In the suction bailer and vacuum washer, a decreased pressure (in some instances approaching atmospheric pressure) is confined to a restricted pipe area through the use of packers. This is accompanied by a surging action of the fluid resulting from the equalization of pressures in which the total pressure due to the hydrostatic head is exerted against the perforations just above the packer. Washers of the pressure type produce increased pressures opposite the perforations through the use of pumps or through tubing travel to overcome restrictions in the perforations, the annular space and the pore space in the sand.

While the production engineer generally advises when a well is to be cleaned, the selection of the method used often rests with the field personnel and a survey has shown that records pertaining to the kind and amount of material removed and to the intimate details of the clean-out operation are very incomplete.

The effective bottom-hole pressures obtained by the various types of bailers, swabs and washers are most generally unknown; and since it is necessary to evaluate the efficiency of the cleaning method on the differential pressure it obtains at the slot opening, the comparison of methods has been based on incomplete data.

Chemical methods.—These treatments of wells, where production is obtained from sand zones, have been for the purpose of breaking down mud sheaths and the lowering of viscosity of mud or sludge material from the pore spaces of the sand and for the dissolving of deposited salts. Morris[5] has pointed out that "it is axiomatic that, before well productivity can be increased by chemical treatment, there must be production obstructed from the hole by a substance or substances which can be effectively broken down by chemical action. To secure results it is essential that an accurate diagnosis be made as to the nature of the material responsible for the subnormal production, so that the proper chemical may be applied in treating the well. Detailed review of chemical clean-out work indicates that unsatisfactory results were obtained at a number of wells because either the chemicals were unsuited for the job or treatment of the well was not justified."

In addition it is entirely possible that the percentage of successful treatments could be increased providing the proper preliminary and follow-up hydraulic methods were applied.

In plug-back operations, or in new well completion where production is to be obtained from limestone, the use of acid through perforations is common practice. The fracturing of the lime formation adjacent to the casing from perforating aids in the more efficient placement of acid and later in increasing the drainage face. Here again the use of the proper hydraulic cleaning method in connection with acidization may increase the results obtained.

Since the engineer controls the kind of fluid in the casing at the time of perforating, the use of the proper chemical opposite the zone to be perforated and at the same time utilizing the pressures and fluid surging effect created by the powder charge may assist in breaking down surface tension dams and in the later removal of foreign materials.

Other methods.—The washing of the productive zone with hot salt water has resulted favorably in some instances, and it is reported by F. R. Cozzens:[6] "Cleaning oil sands with hot air is a practice that is giving good results in the shallow sand fields of southern Ohio. . . . A greater volume of production, better grade of oil, and prolonged life of the well are some of the beneficial results of hot-air sand cleaning. The method is easily adapted to any type of sand and can be utilized at any depth, provided insulation is applied to conserve heat."

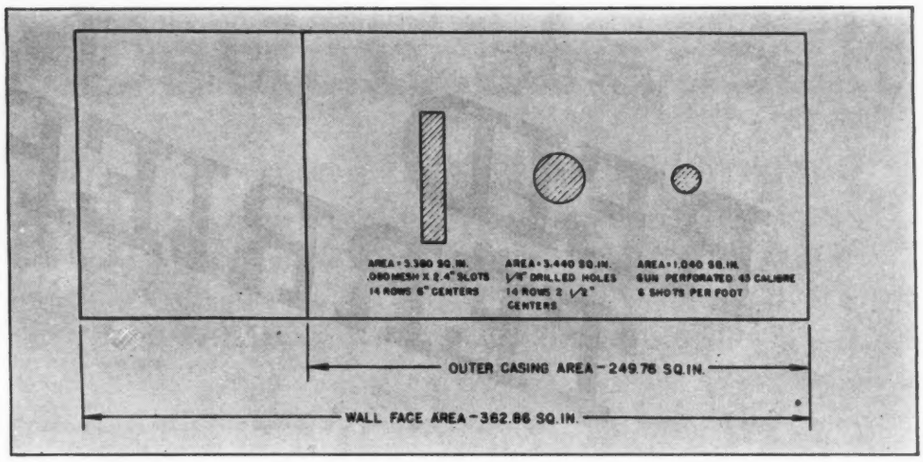
AREA = 3.380 SQ.IN.
.080 MESH X 2.4" SLOTS
14 ROWS 6" CENTERS
AREA = 3.440 SQ.IN.
1/8" DRILLED HOLES
14 ROWS 2 1/2" CENTERS
AREA = 1.040 SQ.IN.
GUN PERFORATED 43 CALIBRE
6 SHOTS PER FOOT
OUTER CASING AREA - 249.76 SQ.IN.
WALL FACE AREA - 362.86 SQ.IN.

Fig. 3—Drainage area per foot of length. For 6⅝-inch, 26-pound casing in 9⅝-inch drilled hole with different perforations.

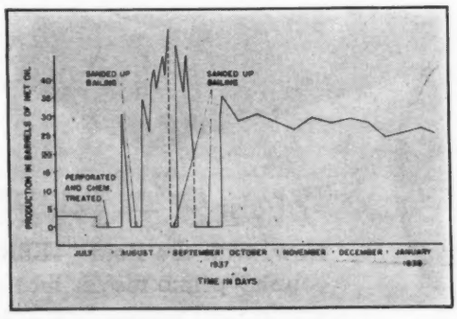

Fig. 4—Production chart of Well No. 1, Huntington Beach, Calif.

Conclusion

The conservation of our natural resources through the production of oil that might never have been otherwise recovered is important. Figure 4 is an example of a well recently treated in the Huntington Beach field, California. Production prior to treatment had declined to 3 bbls. per day and abandonment was considered. The graph indicates the treatment given, with a resulting increase of production to about 28 bbls. per day. It is reasonable to conclude that the treatment in this well was amply justified and there are undoubtedly many wells in which an engineering analysis will show that proper treatment method after perforating will remove obstruction to the free entrance of oil and result in increased recovery.

Gaseous Fuels Committee

A.S.T.M. Committee D-3 on gaseous fuels and its seven subcommittees met in Rochester, N. Y., on March 7 and 8 during committee week. Progress reports were submitted by each of the seven subcommittees. While no standards on gaseous fuels were submitted for approval of the main committee, a fair degree of progress has been made in conducting research on methods of analysis of gases and in determining the calorific value and specific gravity of gases. Arrangements have been made with the National Bureau of Standards for conducting comparisons of different types of apparatus for determining specific gravity. This bureau also is continuing work on the study of equipment and methods for metering gas for analytical and testing purposes and will send standard samples of different types of gases to committee member laboratories for comparison of methods of gas analysis.

Preliminary drafts of methods for determining hydrogen-sulfide sulfur and total sulfur in fuel gases have been drafted and submitted for comment to members of the subcommittee on determination of impurities of gaseous fuels. It was decided to hold the next general meeting of Committee D-3 in conjunction with the annual convention of the American Gas Association in October 1938.

[5] "Chemical Clean-Out of Oil Wells in California," by M. W. Morris, read before the A.P.I. Pacific Coast district meeting at Los Angeles, Calif., on April 13, 1937. Reproduced in full in "Drilling and Production Practice—1937."

[6] "Cleaning Oil Sands with Hot Air," Petroleum Engineer, June 1937.

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Factors in Design of a Salt Water Gathering System

By J. E. BAILEY
Tide Water Associated Oil Co., Kilgore, Tex.

The two main problems in transportation of salt water produced from oil and gas wells are: First, the formation of a precipitate scale that clings to and clogs up the pipe; and second, the formation of a corrosive scale by the action of the salt water on the pipe. A clearer understanding of precipitate scale could be had by reviewing the conditions in which the salt water is found.

Analyses of waters produced from oil and gas wells reveal that the waters contain from 3,000 to 268,000 parts per million of solids, of which usually the largest percentage is common salt (sodium chloride) hence the name well known to the oil industry, "salt water." There are other minerals in salt water which vary as to percentages with the analysis of water in each field, and even vary widely in the analyses of waters in the same field, more especially along fault zones and near salt domes.

Experience has taught the average oil man that in most cases the deeper the hole, as water-bearing formations are found, the saltier the water and the higher the temperature.

The warmer the water, the greater the solubility and hence the larger amount of mineral matter that can be dissolved and held in solution. Increase of pressure to which the water is subjected also has the effect of increasing the solubility, therefore, when salt water is produced from a well, the consequent reduction in temperature and pressure reduce the solubility, and solids may be precipitated.

The oil and salt water are run into a separating tank where the salt water is drawn off from the bottom through a bleeder line, which is elevated near the top of the tank. Here the salt water runs over into another pipe called a syphon, whose upper end is open to the air. As the salt water drops to the ground level it mixes with air for the first time. The most important consideration is to keep the brine from becoming oxidized. In other words, no air should come in contact with the brine anywhere in the system. Once the iron, manganese and sulfur compounds in the salt water are exposed to air, precipitates are formed and the brine becomes acidic. This mixture increases the corrosive qualities of the water and sometimes causes precipitation on exposed surfaces.

Salt water that readily produces precipitate scale is usually high in parts per million of solids; it is this water that is difficult to handle. In some cases, the precipitate scale forms so rapidly that it makes a protective coating for the pipe, thereby preventing corrosion of the pipe by the salt water. The bad feature of this condition is the rapid clogging of lines, which have to be frequently cleaned or replaced.

The first consideration in the transportation of salt water is to ascertain whether or not the minerals will stay in solution in the water until their destination is reached. If not, several methods of coping with the situation have been tried with more or less success for gravity and pressure lines: First, dilute the salt water with fresh water so all the soluble mineral matter will be held in solution; second, use chemicals in the salt water

A.P.I. — Before Spring Meeting of Division of Production, Fort Worth, Texas, March 24-25

to reduce the mineral matter in solution and prevent further precipitate scale; third, increase the velocity of the salt water in the lines and reduce the formation of precipitate; fourth, increase the pressure on the lines which also decreases the formation of precipitate; fifth, clean the lines with scraper, or sixth, steam the precipitate scale in the pipe.

Selection of Material

Serious consideration must be given to the selection of piping materials which are resistant to the chemical reactions of the particular water to be transported.

Under modern producing and waste prevention practices, the oil operator anticipates the life of each pool and attempts to install the best materials obtainable in order to reduce the trouble and expense in the operation of the field. The handling and transportation of salt water have become of vital importance to the oil industry along with the increased number of producing fields although the industry in general has given considerable more study to the handling of oil than it has given to the handling of salt water.

Various kinds of pipe have been used for the transportation of salt water. Information could be obtained from numerous experiments with pipe in various fields such as steel, wrought iron and cast iron whose life varies from two months to 10 years. Each particular problem, however, is a study in itself and usually requires considerable research work in order to obtain pipe of material most suitable for installation for a given life expectancy.

An example of the inconsistencies of salt waters can be readily understood by the fact that wrought iron pipe, after being exposed to sea water of approximately 35,000 p.p.m. of solids for 47 years was dismantled, found to be in good condition and placed back in service. The chemical composition and grain structure of this pipe were analyzed, new pipe was constructed and placed in service in a salt water transportation system in an oil field, where the salt water had 72,000 p.p.m. of solids. Normally, the life expectancy of this new material was about 25 years, but under these conditions was reduced to only two years. Similar history has been found for pipe with galvanized coating, its life having been 20 to 25 years when exposed to sea water; after four years under similar condi-

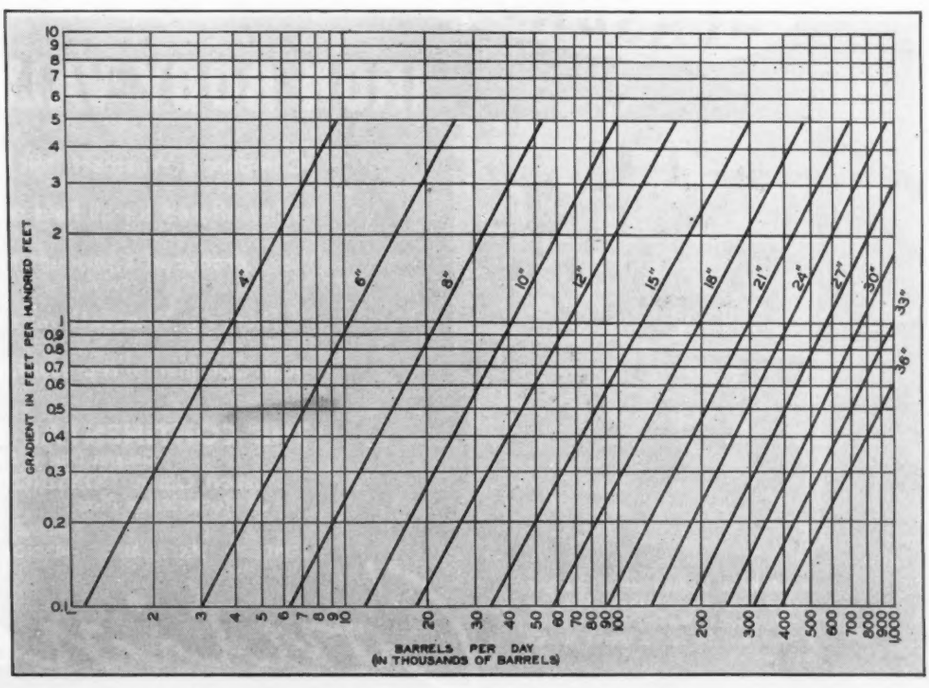

Fig. 1—Curves showing capacity in barrels per day for vitrified salt-glazed sewer pipe.

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tions to the wrought iron pipe, in salt water transportation, the galvanizing had left the pipe exposing it to salt water corrosion.

The corrosive action of salt water on ordinary materials is well known, and its action on plain steel, cast iron and wrought iron is deserving of careful consideration by the oil industry. The average oil producer normally uses second-hand pipe that is available on the lease. Should this fail to meet the estimated needs, he investigates and tries out either wrought iron or cast iron pipe. He may get a longer life by using either cast iron or wrought iron, but still is not satisfied with the trouble he is having in the transportation of salt water. He may find it cheaper to use second-hand steel pipe and replace it when needed, which may be in keeping with the life of the field from which he is producing.

Protective coating of pipe against corrosion has aided considerably in increasing the life of pipe where corrosion is the major problem. Galvanizing of steel and wrought iron has helped to increase the life of these materials in transportation of salt water. Cements have been developed to resist corrosion of salt water and have been used both as a lining for steel pipe where higher pressures are essential, and with asbestos filler as the pipe material itself, where lower pressures are used. A cement has been recently developed and used on the hull of sea-going ships, which gives a smooth surface in contact with the sea water. The cement serves a three-fold purpose: The prevention of sea water corrosion, reduction of friction loss in travel, and the decrease in accumulation of barnacles. Most of the commercial plastics possess good resistant qualities to weak or strong acids, weak or strong alkalies and mineral oils.

A magnesium-base alloy has recently been developed, which possesses properties resistant to salt water corrosion. Although this metal has a high tensile strength, economically it may be excluded, at the present time, as a prospective salt water pipe.

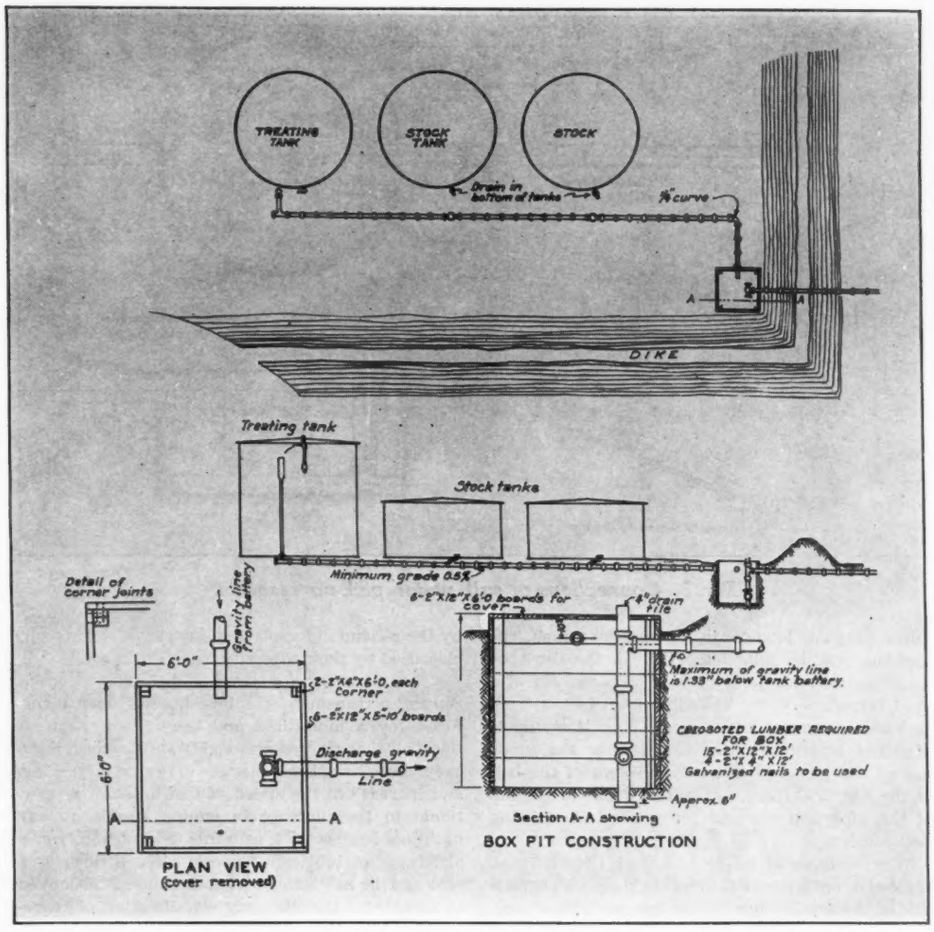

Fig. 2—Connections and pit for salt water gravity line

Design and Construction of a Gathering System

Let us consider the design of a salt water system for a field producing salt water which does not form precipitate scale readily in the pipes.

The most economical type of gathering system would be a gravity system with pick-up reservoirs on each watershed. Vitrified salt glazed tile with unoiled jute and asphalt joints is an economical and satisfactory carrier to use. A flow chart for various size pipes for the gravity system should be compiled for the quantity to be handled and the per cent grade to be used. Kutter's formula should be used with a coefficient of friction, value n = 0.011, for vitrified salt-glazed sewer pipe. (See Figure 1 for a flow chart.)

The entire gravity system may be laid out in the office on a contour map of the field and only a few changes will be necessary in the field at the time of staking the lines. All gravity tile lines should be buried 3 to 4 feet below the surface of the ground. This depth is desirable for three reasons: First, for protection of the tile pipe; second, the normal ground water level is at this depth, which will minimize infiltration and leaks in case of bad joints, or unforeseen cracked pipe; third, there will be very few previously laid pipe lines to be raised or lowered to maintain the grade of the gravity lines. All tile pipe which cross roads should be tied down and concrete poured around and on top of the pipe before being backfilled with dirt to insure protection from vibration of travel on the road and wash out from drain ditches along the road.

Salt water tile gravity line originates at the treating tank, passes in front of the stock tanks with a connection for each tank, thence into a 6-foot cube creosoted pine box put together with galvanized nails and located in the inside corner of the fire wall. This box serves as an oil trap for the tank battery. (See Figure 2.) The salt water is piped out near the bottom of the box, and thence with the fall necessary, into the network of the gravity system. At the pick-up reservoir another oil trap is located in the form of a 250-bbl. tank buried in the ground. (See Figure 3.) The purpose of this tank is to trap any oil that might happen to get through the box at the tank battery. All of the gravity lines should have continuous fall from the box at the tank battery to the trap at the pick-up reservoir—there should be no inverted syphons in the system. Should oil and water flow through an inverted syphon, there would be a tendency for the oil to stay on the upper side, b.s. to form in the syphon, and, in time, clog up the pipe.

The continuous fall for the gravity system makes it necessary to have creek spans as part of the gravity system. Cement or cement-lined pipe of required diameter and grade may be used. The creek spans should be anchored at each end with concrete thrust piers, and should have an expansion joint in the center to insure no movement at the connection with the tile pipe. The tile pipe up to the thrust pier should be covered with at least 2 feet of dirt, sodded with grass for protection from the weathering of the asphalt joints and lease travel.

Asphalt with a melting point from 215° F. to 230° F. will give the best results for tile joints, when the tile is perfectly dry and clean and the asphalt heated to 550° F. To insure that the asphalt will remain hot enough for pouring, insulated cone pouring pots should be used. The asphalt can be heated in a 2-bbl. asphalt-kerosene kettle on wheels. At the end of each day the kettle should be cleaned of the old asphalt, for the residue after being heated all day is of a higher melting point than should be used in the joints.

The trenches or ditches can be dug to within one-tenth of a foot of grade with ditching machines, by attaching a level indicator held horizontally in place by a pendulum weight.

In pouring the asphalt joints, 10 to 15 minutes are required for the joints to cool. To prevent delay in laying the line, a "stand wagon" may be used. The stand wagon is constructed by building a bed on a four-wheel wagon about 10 feet high with six pipe arms on each side to fit in pipe standing alongside the wagon. A team may be used continually on the job to either pull the equipment near the work, or backfill the trench with a Mormon board.

When the "stand wagon" is up to the location, the tile is laid on the ground with spigot end toward the side of the wagon, with six rows of tile on each side; then the 2-inch steel pipe or stiffeners are run through them and raised to a vertical position on the side of the wagon and held that way with the arms on top. The annular space of the tile joint is then caulked one-quarter of the depth of the joint with dry unoiled jute; hot asphalt is then poured into the joint and allowed to cool enough to handle. The sections are then lowered and two men carry each section to the crew in the trench to be tied into the line already laid. The 4-inch tile may be made up six joints to a section 12 feet long; 6-inch tile, five joints to a section or 10 feet long; 8-inch tile three joints to a section or 9 feet long. The 10-, 12-, and 15-inch tile may be made up two joints to a section, 6 feet long, stood on the ground without the aid of stiffeners, then rolled

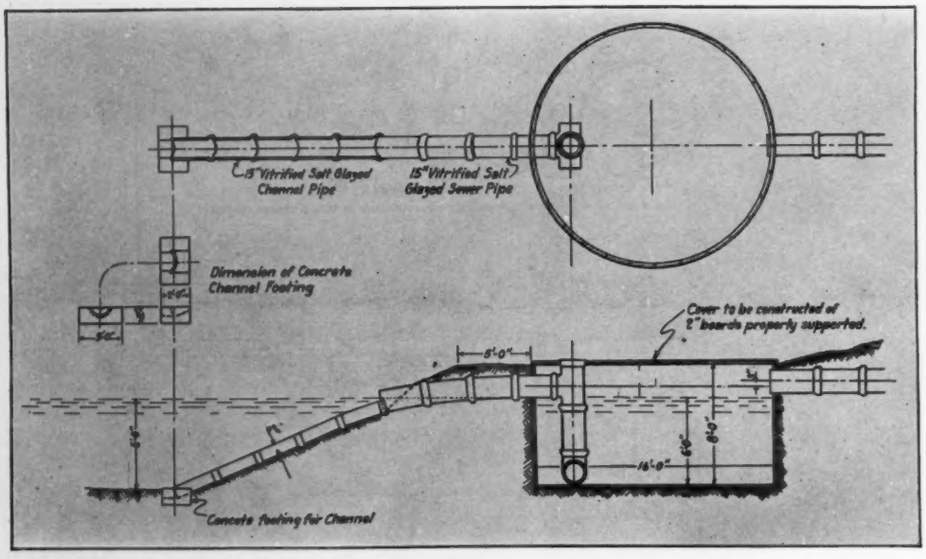
15" Vitrified Salt Glazed Channel Pipe
15" Vitrified Salt Glazed Sewer Pipe
Dimension of Concrete Channel Footing
Cover to be constructed of 2" boards properly supported.
5'-0"
16'-0"
Concrete footing for Channel

Fig. 3—Connections at salt water pick-up reservoir

into a sling and lowered in place in the trench. The sections may be joined together in the ditch by using an asbestos joint runner with the aid of a mud funnel.

The sections of 4-inch and 6-inch lines, made of 2-foot lengths of tile, should have the grade line of the trench dug for the bottom of the bell of the tile, backfilled, tamped by hand to the top of the pipe and checked for grade before being backfilled.

The sections of 8-, 10-, 12-, and 15-inch lines, made of 3-foot lengths of tile, should have the grade line of the trench dug for the bottom of the pipe. All bell holes should be dug by hand. After these sizes of pipe have been laid, tied together and cooled, the trench including bell holes should be backfilled, tamped by hand to one-half the top of the pipe, and given a final check for grade. Then the remaining backfilling may be done.

The pick-up reservoir usually has to be constructed near the bed of the drain on approximately level ground. It should be designed to hold two days' maximum production of salt water from all wells on the watershed. It should also be designed so that the height of the water will not be above the discharge of the gravity line when it has reached its designed capacity. Usually the ground at the location of the pick-up reservoir is mostly sand with very little clay. Therefore considerable work should be done in analysis of the soil to obtain a mixture of clay with sand to make the pick-up reservoir as nearly leak-proof as possible.

Summing up the handling of salt water produced from oil and gas wells: Salt water that is low in parts per million of solids can be handled easily as materials for combating corrosion have been developed. In handling salt water that is high in parts per million of solids that readily form a precipitate scale, and is also corrosive, it is found that most materials make it imperative that the precipitate scale be reduced to a minimum before selection of pipe for transporting the salt water.

New S.A.E. Classification for Transmission Lubricants

The object of S.A.E. lubricant classification is to make it as easy as possible to select the most suitable viscosity for the conditions of use. Changes in automobile design and usage naturally leads to the necessity of occasional revision of classifications, which led some years ago to the introduction by the oil and automotive industries of winter oils classified by their viscosity at 0° F.

The necessity for several different viscosity ranges in transmission lubricants has been recognized for a long time and the classification of these oils has proved reasonably satisfactory. However, there have been changes in design of gearing, and increase in the speed of transmission proportional to the increase in engine speeds, to say nothing of the coming into this field of highly special types of lubricant. Therefore, a little over a year ago the lubricants division of the S.A.E. moved to reconsider the viscosity classification of transmission oils, this resulting in the issuance of an entirely new classification, which was approved by the standards committee of the society last January.

Previously, there have been five viscosity classes for transmission lubricants, and a careful study of actual practice soon showed that this was an unnecessarily large number. Furthermore, the old viscosity classification was based entirely upon 100° F., whereas the basis upon which the use of different grades was recommended was principally a matter of selecting a grade considered to be best for the average temperature of use. In other words, the heavier grades were recommended for summer use, and lighter grades for winter use.

This immediately suggested that a better classification could be based upon different temperatures. S.A.E. 80 corresponds more or less, in the transmission and rear axle classification, to the lightest grade of engine oil in engine oil classifications. It exists because a transmission lubricant really fluid at quite low temperatures is necessary. Therefore, the committee felt that the logical thing was to pick a temperature at zero for classifying S.A.E. 80.

The winter grade by far in widest usage is S.A.E. 90, and after thorough consideration of several lower temperatures the committee concluded that every purpose would be served by classifying S.A.E. 90 at 100° F. Therefore, in the new classification, S.A.E. 90 remains the same as it has always been. S.A.E. 80 is classified by a maximum viscosity at zero which is far more reasonable.

Heavier than S.A.E. 90 there were previously the three types—110, 160, and 250. These were all intended for normal summer operation. Since, today, transmission and rear axle temperatures are not a very great deal less than those prevailing in the engine, a classification at 210 is much closer to service temperature. This, therefore, was chosen for the new classification of summer lubricants. Furthermore, the committee's study showed that there was no necessity for both the 110 and 160 classifications. These, therefore, have been replaced by a new number, S.A.E. 140. It represents the more desirable lubricants of both these old classifications, in that the viscosity gradings are taken at temperatures more nearly corresponding to the temperature ranges for which they are recommended. This new grade will therefore simplify car manufacturers recommendations and reduce the number of grades which have to be carried at filling stations.

S.A.E. 250 is used to some extent in truck, bus and industrial service but it is rarely used for passenger cars. It is probably most frequently employed where provisions against leakage are not too good, and therefore economy can be obtained by using something heavier than the normal summer oil. Except for the fact that its minimum viscosity is now classified at 210° F. instead of 100° F., S.A.E. 250 remains essentially unchanged.

A reminder is perhaps necessary that when S.A.E. classifications are changed, the old classification remains in force simultaneously with the new one for a period of 18 months. Therefore, the old schedule including S.A.E. 110 and S.A.E. 160 retains its official status until July, 1939. It is, of course, expected that refiners will immediately adopt the new classification and that during the next 18 months practically all stocks of the old branding will have been consumed. Because S.A.E. 140 replaces two old grades, this, in a majority of cases, will not mean any actual change in lubricants now in existence. Most of the S.A.E. 160 oils now on the market are within the viscosity range of the new S.A.E. 140, so, in most instances, the only actual change will be in the brand number.

As appears in the copy of the classification below, the old requirement concerning channeling remains in the classification. There is, of course, no standard test for this characteristic. It means that lubricants must not channel in actual service at the specified temperatures.

The actual classification as it will appear in the 1938 S.A.E. Handbook reads as follows:

"The S.A.E. viscosity numbers for transmission and real axle lubricants constitute a classification in terms of viscosity and of consistency at low temperatures only. Other factors of quality or character are not considered.

"The viscosity range and consistency at low temperatures for the several classes of transmission and rear axle lubricants are defined in the following table:

S.A.E. viscosity No.	Viscosity range Saybolt Universal	Consistency must not channel in service at °F.
S.A.E. 80	100,000 seconds at 0° F. max.	—20
S.A.E. 90	800 to 1,500 seconds at 100° F.	0
S.A.E. 140	120 to 200 seconds at 210° F.	+35
S.A.E. 250	200 seconds at 210° F. min.	....

"In the case of S.A.E. 80, the minimum viscosity limit is not specified since this grade is specially for use at very low temperatures at which S.A.E. 90 would be too heavy. The oil company furnishing the lubricant shall be responsible for maintaining a sufficiently high maximum viscosity to provide satisfactory lubrication. In a similar manner the maximum viscosity limit for S.A.E. 250 is not specified since this grade is a special one for temperatures at which S.A.E. 140 is too light. The oil company furnishing this lubricant shall be responsible for maintaining a sufficiently low maximum viscosity to provide satisfactory shifting of gears without channeling at the lowest temperature for which the lubricant is recommended.

"In the case of fluid greases made by adding soap or other thickening ingredients to oil, the viscosity number by which the lubricants are classified shall be determined by the viscosity of the oil before the addition of the soap or other thickening ingredients."

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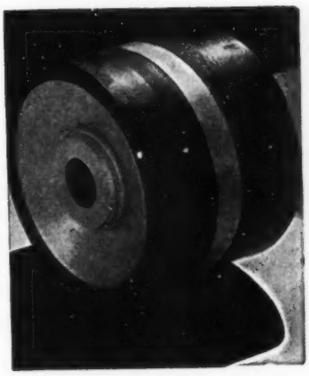

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PROBLEMS FROM READERS

Edited by L. G. E. Bignell

Comparison of Recovery From Lime and Sand Pools

Your recent answer to a question "Probable Life of Limestone Oil Fields" suggests further comment. In Illinois and in Ranger, Tex., and elsewhere, 2 feet of soft lime "pay" may produce more oil than 100 feet of rich sand under similar pressures. How do you account for this?—T. M. G.

Emmon's "Geology of Petroleum" reports the discovery well in Ranger on the McClesky farm as producing from a sand 200 feet below the top of the Black lime at a depth of 3,431 feet.

From problems in Petroleum Geology the following is quoted:

"The oil in the 'Bend' limestone in the Ranger district is very generally thought to be indigenous to the limestone, or to have migrated downward from the immediately overlying black shale (Smithwick), or to have come from both sources."

From the same source as quoted above:

"In the earliest reports on the fields of Illinois, southwestern Indiana, and western Kentucky, the shales immediately associated with the reservoirs in the Mississippian and Pennsylvanian sections were stated to be the probable source beds, and there seems to have been no change in opinion."

This seems to indicate that though the oil may be produced from the limestone it has adjacent source beds from which it has migrated. In many limestone fields faults and fissures may form conductors to transport oil from deeper underground reservoirs.

For a direct comparison of production from limestone and sands, both of Pennsylvanian age, the following data has been selected covering Eastland County, Texas. This does not include the Ranger field, which is regretted because you mention it, but it does cover fields in that vicinity.

Eastland County, Texas.

Hillburn pool. Bend lime. 400 acres. 1,085,970 bbls. produced to the end of 1936, or 2,720 bbls. per acre.

Pioneer pool. Caddo lime. 1,400 acres. 5,265,841 bbls. produced to the end of 1936, or 3,760 bbls. per acre.

Mangum pool. Strawn sand. 300 acres. 732,063 bbls. produced to the end of 1936, or 2,440 bbls. per acre.

Ramsour pool. Bond sand. 250 acres. 1,394,176 bbls. produced to the end of 1936, or 5,570 bbls. per acre.

This indicates an average yield per acre of about 4.000 bbls. for the sand pools and only 3,240 bbls. for the limestone fields.

The statement that "2 feet of soft lime 'pay' may produce more oil than 100 feet of rich sand under similar pressures" is hard to reconcile with facts.

Two acre feet of oil would total 14,516 bbls. without any rock. Therefore, if the lime did not exist, the 2-foot space could only contain that volume of oil.

With 20 per cent porosity, which is low for "rich sand," there could be 1,551 bbls. per acre of oil in the formation. For 100 feet of such sand, if all was recovered, the total would be 155,100 bbls., or about 10 times more than could be secured from 2 feet of void or open space in any formation.

Chokes For Controlling Flow of Well

I have been interestedly watching the reports of drilling of Amerada Petroleum Corp. No. 1 South Coast Corporation well in the Raceland field, Lafourche Parish, La. In the issue of February 10th this well is reported as having flowed at the rate of 733 barrels of fluid in 24 hours through a quarter inch choke with tubing pressure 1,500 pounds and casing pressure 1,875 pounds. Does this mean that the actual recovery was through a quarter-inch choke or was it computed on the basis of what it would run through the tubing if allowed to flow freely?—R. H. A.

In reply to your letter the full capacity of the well in question if it had been permitted to flow through casing or tubing without choke would have been much higher than the rate reported.

To produce a high-pressure well it is necessary to control volume of gas and fluid admitted into the traps at the surface. In this instance the well now registers a casing head pressure of about 2,300 pounds. It is necessary to dissipate this high-pressure so the gas and oil can be handled safely at the surface. This means an ultimate reduction of pressure to about atmosphere.

Gas under 2,300 pounds will expand about 153 times in being lowered to atmospheric pressure. In other words each cubic foot of gas accompanying the oil would occupy about 153 cubic feet in the surface vessel required to handle the oil and gas mixture.

With a well capable of flowing a large volume of gas and oil this would necessitate the use of several high-pressure oil and gas separators. At the same time the rate of production would be much in excess of market demand for the oil so the equipment would not be economically useful.

To avoid these complications of handling large volumes of oil and gas at the surface a choke, or piece of steel about 9 inches long bored through with a small hole is introduced into the flow line at the well head. This choke restricts volume of flow from the well, or in other words regulates the volume of oil and gas to be delivered to the oil and gas separator much as it might be regulated with a valve, only the valve could not withstand the enormous pressures and cutting action of sand accompanying the oil.

To specifically answer your question the production reported is the volume actually produced through the quarter-inch choke but is not the full capacity of the well. What this well would make if permitted to flow unrestricted through the tubing is not known. To attempt such a test would be taking too much of a hazard and be too dangerous to be carried on with the surface equipment selected to meet the economic requirements of producing this well.

The choke is usually a piece of high grade steel varying in length but probably averaging about 9 inches long, through which a straight hole has been bored. The diameter of the holes increase by one-sixteenth of an inch. The smallest diameter hole is probably about one-eighth inch and the largest something over 1 inch. The selection of the choke is made by past experience with wells of similar character or by the try-and-change method.

More About Gold on the Ocean Bottom

Thank you for your prompt and thoughtful reply. As to how extensive is the gold-bearing sand? To determine this more samples will have to be taken. When I wrote I had in mind a rotary mud pump with hose connected to the intake and extending to the sand. Being open at the bottom I figured the external and internal pressures on the hose would be equalized and a lift of 25 feet above surface would be sufficient to put the sand on board, where it could be run through a series of rockers and the gold caught and the sand dumped back into the ocean.

The "sand" as a matter of fact is not sand but a soft blue mud. No one knows the thickness of this mud, nor whether the gold plays out or gets richer with depth, nor has the extent in area of this mud been determined. To do this is the next step, and possibly you can suggest some contrivance that could be used on the end of a wire and reel such as is used in measuring the depth of wells. The samples so far secured have been from the mud that stuck to a sounding weight.—H. A. S.

Referring again to the matter of producing gold-laden mud from sea bottom.

You may be interested to know that in Apache, Coconino and Navajo counties in northeastern Arizona there is an area of approximately 12,000 miles underlain by Chinle clays containing an average of 5 cents worth of gold (old price) per cubic yard. This deposit is described in U.S.G.S. professional paper 93, pp. 42-50 published in 1917.

A. C. Lawson describes The Gold in the Shinarump at Paria, Utah, in Economic Geology, vol. 8, pp. 434-448, 1913. According to him these clays, when examined microscopically, appear to be composed almost wholly of a colloidal substance with a very small admixture of fine silt and some concretion of lime carbonate and iron oxide. When immersed in water, the clays swell enormously, break down rapidly, and run like milk. The mixture is in such a fine state of division that it passes freely through filter paper. Lawson found that these clays averaged 5 cents per cubic yard at Paria, Utah, and states that they "appear to be similarly auriferous at Lee's Ferry" and it is probable from the extreme uniformity in the physical characteristics of the formation wherever it has been observed that it is similarly auriferous throughout its extent. The gold is probably in a very finely divided condition.

In Arizona the Chinle underlies with a maximum thickness of 1,182 feet an area of approximately 12,000 square miles, and outcrops over approximately 4,000 square miles. If the average gold content is 5 cents per cubic yard and the average thickness be taken at 500 feet, or less than half of the maximum, then the total gold content of the outcropping areas of the Chinle in Arizona is over $103,000,000,000 and the total for the whole formation in the state is over $309,000,000,000.

Lawson states, however, that "The value of the ground is very problematical."

All this is quoted merely to indicate that it is hardly necessary to explore an ocean bottom to find an abundance of gold and it is predicted that the mud to which you refer as being at ocean bottom contains gold in much the same proportions as the Chinle clays in Utah and Arizona.

QUESTIONS ON TECHNOLOGY

By Charles K. Francis, Ph. D., Technical Editor

Cost of a Barrel of Oil, Employment and Payroll Data

Would you furnish the figures relating to the cost of labor for drilling and producing per barrel of crude oil? We want to know also the number employed in refining and other departments and total payroll.—R. G.

A complete breakdown showing distribution of all expense involved in the production of a barrel of crude oil, is not available. However, the material following may be of some value as related to the question.

A report of Oil Administrator Harold L. Ickes, United States department of interior, released in 1934, showed the average cost of a barrel of crude oil in 1933 to be 71.7 cents, as compared with $1.05 as the average cost during the period from 1927 to 1930. Flush oil conditions are reflected in the East Texas field, where the cost per barrel was 54.8 cents for the three-year period from 1931 to 1933, and at Oklahoma City it was 84.6 cents for the same period. In Kettleman Hills, California, it was only 8.9 cents at the same time. This last figure became so low because of the revenues from the sale of gas, produced with the oil. The average cost of producing oil in all states during the period 1931 to 1933 was 80.6 cents per barrel.

The same report shows the operating expense per barrel of oil produced to vary from 18 cents in the Mid-Continent to 83 cents in the eastern division.

A similar report issued the next year gave the average per barrel cost for the United States at 77.5 cents and the selling price 98.4 cents. An eight-year weighted average cost for all states was 92.4 cents.

The difficulties met with when endeavoring to arrive at a true cost are indicated in the statement following, from the September 19, 1934, report:

"Treatment of cost items—The cost items of depletion, depreciation, operating costs, and general overhead including lease cancellations, dry holes, lease rentals and other nonproductive expenses were handled in a similar manner to that employed by the Tariff Commission.

"A change in method of handling drilling and other intangible costs was decided upon whereby a more accurate result, owing to the proration of flush fields, would be obtained. Therefore, all such costs incurred subsequent to January 1, 1931, for producing areas west of the Mississippi River were capitalized and amortized with respect to the number of barrels of crude petroleum estimated to be recovered. This departed from the method adopted by the Tariff Commission in as much as these costs for its report were expensed or capitalized according to the practice of the companies. No change was made in company figures where the practice had always been to capitalize these costs. For operations east of the Mississippi River, where proration was not in effect, no departure from the method employed by the companies of either capitalizing or charging these costs against current operations was made.

"To the total cost interest at 6 per cent on the net investment was added while receipts from gas sales and miscellaneous revenue were deducted from the cost."

There are approximately 1,000,000 persons employed in the petroleum industry of the United States, with an estimated annual payroll of $1,500,000,000, said to support some 4,000,000 citizens. About 15 per cent of the employed personnel is engaged in drilling and production. About 75 per cent are active in sales outlet and slightly more than 10 per cent in refining.

The annual payroll of the industry in 1936 was $1,250,000,000 and the production 904,000,000 bbls., or equivalent to a value of $1.38 per barrel.

Reference: American Petroleum Institute Facts and Figures, 5th Edition, 1937.

Analysis of Crude Oil From Tokio Sand, Nevada County, Arkansas

Please furnish us with the analysis of the crude oil produced from the Tokio sand in Nevada County, Arkansas.—P. R. C.

The Tokio sand oil is exceptional in several respects. The oil has a relatively low gravity, contains no light oils and the sulfur content is high when compared with some of the better oil produced in other parts of the Mid-Continent district.

TOKIO SAND OIL FROM NEVADA COUNTY, ARKANSAS

Gravity, °A.P.I.	21.5
Viscosity Furol at 122° F.	34
Pourpoint, °F.	0
Sulfur, total per cent	2.2
Flash, °F.	200

Yield on distillation—	Tests	Per cent
Furnace oil, No. 2		30
Gravity	36-38	
Pourpoint, °F.	0	
Viscosity at 100° F.	38	
Wax distillate		25
Gravity	24-26	
Viscosity at 100°F.	225	
Flashpoint, °F.	380-400	
Pourpoint, °F.	50	
Residue		43
Softening point, °F.	105-110	

Oils of this type make good cracking stock and are extensively used for the manufacture of high-grade asphalts.

Questions on Petroleum Technology may be sent to Dr. Charles K. Francis, The Oil and Gas Journal, Tulsa, Okla. When a copy of the answer is desired postage should be enclosed.

CHEMICALS FOR THE PETROLEUM INDUSTRY

Paradichlorobenzene

Use—Special preparations with naphtha for moth repellent, deodorant and insecticide.

Form—White to clear crystals, pleasant odor.

Formula—$C_6H_4Cl_2$.

Specific gravity—1.458.

Boiling point—344° F.

Melting point—127°F.

LIMITATIONS

Flashpoint, min.	152° F.
Freezing point	127° F.

Graded by size as—Coarse, No. 1 medium, No. 2 medium, etc. Supplied by size.

Metal Apparatus For Analysis of Gases at Low Temperatures

Is there any apparatus available, which is less expensive and not so complicated as the several types that are offered on the market, for making the physical analysis of gases and petroleum vapors? I want to know if there is an apparatus which is suitable for use in a field plant.—L. R.

The apparatus available for the low-temperature analysis of petroleum gases and vapors is well adapted for laboratory use, is easy to operate and gives excellent results. However, the lack of portability, extreme fragility and difficulties encountered in obtaining the required liquid air for cooling prevent its use for field testing and general plant control. A study of these conditions suggested to F. N. Laird the construction of suitable apparatus entirely of metal. This has been described in The Oil and Gas Journal, this discussion being based on the article.

A search revealed the possibility of designing an apparatus which would partially condense a gas sample, fractionate the portion lighter than isobutane as a lump, and retail all of the isobutane and heavier fractions. The possibility of determining propane seemed very promising also.

W. J. Murray has developed a formula for calculating the amount of any hydrocarbon which will condense under any pressure and temperature. It is:

$$C_1 = \frac{LC}{100\frac{P_c}{P} + L\left(1\frac{P_c}{P}\right)}$$

where:

C_1 = mols of component in liquid after condensation.
C = mols of component in gas.
P_c = absolute vapor pressure of pure component at temperature of condensation.
P = total pressure on system.
L = total mols of liquid after condensation.

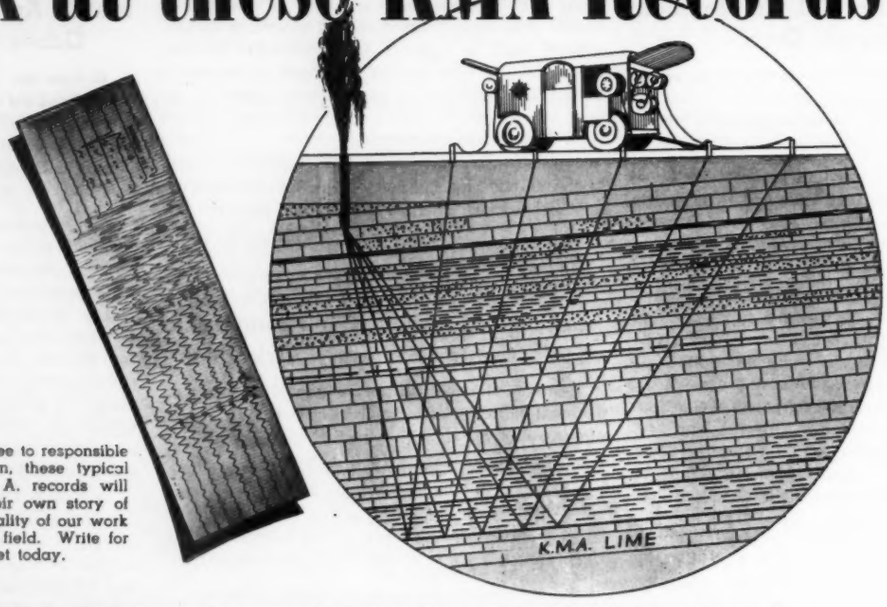
With this formula a series of calculations were made to find how much of each component will condense at —110° F. (sublimation temperature of carbon dioxide), and pressures from 0 to 32 pounds, absolute. These calculations were carried out for propane, isobutane, butane, isopentane and pentane.

The unit designed to accomplish the condensation and fractionation of the gas is primarily a reproduction of standard fractionation apparatus in metal. All glass parts are eliminated except the kettle and butane condensation bulb. The final apparatus consists essentially of a gas dehydrating unit, graduated condensing and distilling kettle, fractionating column, condenser section, pressure gauge, rate control valve and rate manometer, butane condensation bulb, displacement meter capable of measuring under vacuum, and a vacuum pump. All of these items are assembled of materials lending ready portability to the completed unit. The dimensions of the various parts, in relation to one another, are very important if accurate results are to be obtained.

Further details, with size, etc., of the parts, may be obtained from the reference.

Reference: F. H. Laird, "Low Temperature Fractionation of Gases, Vapors and Liquids," The Oil and Gas Journal, October 28, 1937, p. 58.

Look at these KMA Records



Sent free to responsible oil men, these typical K. M. A. records will tell their own story of the quality of our work in this field. Write for your set today.

LONG experience in mapping the dips of the K. M. A. pay, and ample facilities to give prompt service on contract jobs of any size are the two features offered clients. Early last fall we entered the area and ours was the first crew to take reflections off this now famous pay lime in the K. M. A. field. Today, four (4) crews and a division office at 623 Hamilton Bldg., Wichita Falls, are serving our clients in this field.

Smaller contract jobs carry the same assurance of thorough, skillful work as the very large ones. Every map and report submitted to our clients has behind it the combined experience of our 7-man supervisory staff, each of whom has from 10 to 13 years of geophysical work to his credit. This staff checks and correlates the work of our seasoned party chiefs who themselves have an average of 6½ years of geophysical field experience.

Our K. M. A. records are interesting, showing reflections from the top of the K. M. A. lime and are very accurate and readable. We will send any operator or geologist a set of typical records to illustrate this point, free of cost or obligation. Just make the request on your letterhead. Cost estimates on work in any part of the world will be furnished upon request.

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FIELD OPERATIONS

Summarizing the Week's Developments

OKLAHOMA—A wildcat in Seminole County, between the Konawa and St. Louis fields, was estimated good for 400 bbls. of oil daily. The Hughes County pool opener near Calvin flowed 1,134 bbls. of 39-gravity oil in the first six hours, and continued to produce at the rate of 25 bbls. daily, cutting some water, as operators tested through various chokes. The deepest test ever drilled in Oklahoma, in section 14-4-5w, Grady County, had drill pipe stuck at 11,415 feet.

KANSAS—A Graham County wildcat cored saturation in Arbuckle lime, giving promise of opening the county's first oil pool. A new Russell County area was opened in section 4-15-12w, and another Russell wildcat in section 19-15-15w, was showing as a probable pool opener. Opening of a new pool in section 1-15-16w, Ellis County, also was indicated. The Graber pool, McPherson County, was extended one-fourth mile east.

NEW MEXICO—The Hobbs field was extended one-fourth mile east by a 748-bbl. well in section 34-18-38. A west outpost in the Jal sand area was completed in section 33-24-37 for 891 bbls. of oil daily. Largest Lea County completion of the week was a 2,688-bbl. well in the northeast extension of the Cooper pool. A new pool was opened in section 1-26-37, extreme southeastern Lea County.

TEXAS—On the Gulf Coast a shallow field was opened in Jackson County by a 177-bbl. well at 2,652-57 feet. Houston's new pool was assured when the discovery well flowed at the rate of 600 bbls. a day through quarter-inch choke from pay at 7,697-7,722 feet. In Southwest Texas the West Saxet field was extended south and a new sand opened at 5,641-61 feet which yielded 10 bbls. per hour through a five-thirty-seconds inch choke. The same field was extended northerly by two producers each good for around 260 bbls. per day. Twenty-two wells with a combined initial production of 19,751 bbls. were completed in the K.M.A. field in Wichita and Archer counties. The best well thus far completed in the Slaughter field in Hockley County, in West Texas, started at 917 bbls. per day.

TEX-LA-ARK AREA—An important extension to the Jefferson field in Marion County, Texas, is expected when a test in the Charles Lockhart Survey is completed. It has already shown an estimated 30,000,000 feet of gas. In Arkansas attention has shifted from the disappointing test east of Magnolia to the Standard Oil Co. of Louisiana test near Village, also in Columbia County. Same company's southwest Buckner outpost is a disappointment, further limiting the size of that recently opened pool.

ILLINOIS—Thirty wells were completed in the Illinois Basin fields, of which 26 were oil wells, the new Centralia field supplying the bulk of these. That new pool is growing weekly and is by far the busiest area in the basin.

CALIFORNIA—Eleven wells with a combined initial production of 29,504 bbls. were completed in the Wilmington field, the largest well starting at 6,480 bbls. A new sand was opened on the western side of the Montebello field which is being tested. It has already shown a potential of 1,500 bbls. of oil and 10,000,000 feet of gas.

MICHIGAN—The second well in the Edenville field in Midland County is regarded as a better producer than the discovery well in its early stages. It is rated at 1,200 bbls. per day.

Completions in All Fields

(Week Ending March 26, 1938)

	Oil	Gas	Dry	Total	1938 total comp. to date	1937 total comp. to date
N. Y., Pa. and W. Va.	60	12	3	75	1,179	1,040
Ohio	2	2	3	7	212	223
Indiana	0	0	1	1	25	27
Kentucky	5	0	5	10	176	28
Illinois	24	0	6	30	158	14
Michigan	8	0	6	14	173	182
Kansas	24	0	5	29	450	464
Oklahoma	9	3	8	20	403	597
Texas:						
North Central Texas	46	1	29	76	638	620
West Texas	37	0	4	41	553	568
Texas Panhandle	9	3	0	12	179	140
East Texas	39	0	0	39	589	471
East Central Texas	2	1	1	4	90	153
East Texas Border	0	0	1	1	37	100
Gulf Coast Texas	24	1	10	35	298	286
Southwest Texas	34	3	3	40	484	797
Total Texas	191	9	48	248	2,868	3,135
North Louisiana	9	2	2	13	143	93
Gulf Coast Louisiana	5	0	2	7	120	116
Total Louisiana	14	2	4	20	263	209
Arkansas	2	0	0	2	47	25
Montana	0	0	0	0	12	19
Wyoming	0	0	0	0	41	23
Colorado	0	0	0	0	1	6
New Mexico	11	0	1	12	141	180
Utah	0	0	0	0	0	0
California	25	0	8	33	328	311
Total United States	375	28	98	501	6,477	6,483
Total previous week	382	45	95	522		
Difference	7	17	3	21		

Outstanding Fields--Highlights

(Week Ending March 26, 1938)

FIELD—	Rigs up	Wells drlg.	Weekly oil completions	Initial prod.	Total No. oil wells	Daily av. prod.
TEXAS						
Hastings	4	11	5	2,602	495	18,798
McCampbell	1	5	2	374	112	5,210
Saxet	1	6	1	74	589	37,136
Benavides	4	12	4	720	162	9,730
East Texas	49	76	39	1,922	24,811	429,165
Talco	2	6	0	0	621	26,703
K.M.A.	40	117	22	19,751	216	7,710
Ector County	25	90	14	19,284	933	30,046
Winkler County	8	25	3	3,543	1,600	36,817
OKLAHOMA						
Fitts-Jesse	2	9	1	136	965	64,600
Oklahoma City	2	18	1	2,322	1,057	109,450
KANSAS						
Barton County	6	22	6	2,569	302	11,900
Ellis County	5	22	3	1,329	299	9,065
Rice County	7	24	1	449	1,128	33,985
Russell County	6	44	5	2,705	1,036	30,450
NEW MEXICO						
Lea County	10	101	9	4,789	1,665	97,710
LA-ARK-TEX						
Rodessa, Ark.	1	9	1	1,130	72	8,210
Rodessa, La.	0	5	3	975	451	40,775
Rodessa, Tex.	1	21	0	0	408	37,065
Lisbon, La.	2	8	4	4,990	193	10,730
Shuler, Ark.	3	17	1	1,865	33	18,490
MICHIGAN						
Buckeye	2	21	4	757	381	25,647
ILLINOIS						
Central Illinois	34	111	24	7,668	343	26,950
CALIFORNIA						
Wilmington	11	38	11	29,504	411	97,250

Less than 1° off vertical. . . .

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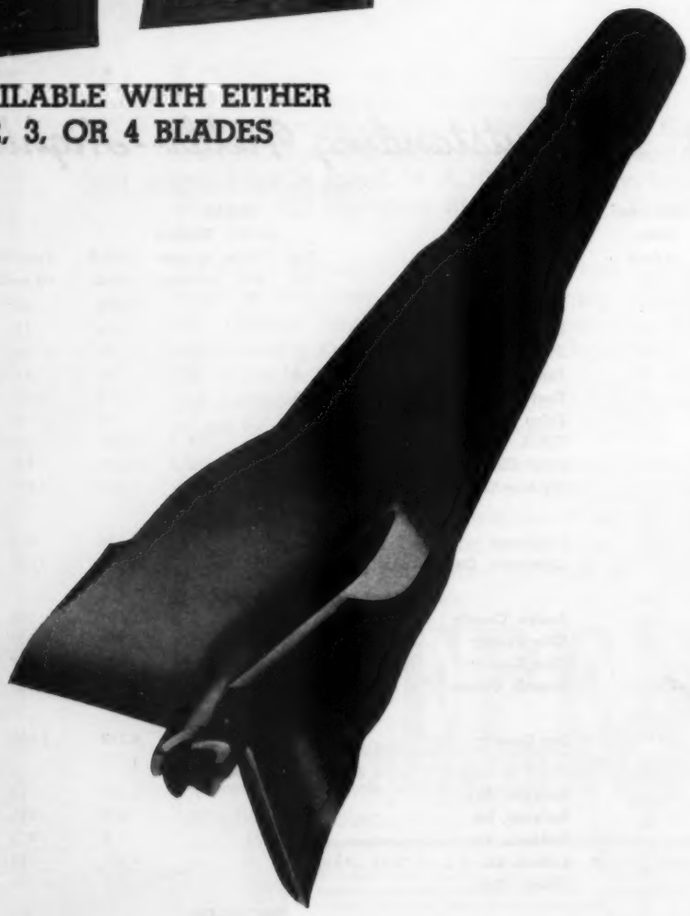
2, 3, OR 4 BLADES

The REED W-I-B
(WELDED-IN BLADE)
DRILLING BIT
WAS USED DOWN TO
2400 FEET
1 — 18" AND 2 — 12½"



The REED B-R
WIRE LINE
DRILLING-CORING BIT
WAS USED FROM 5182 FT.
TO 5608 FT. (COMPLETION)

1—6¾"— 3 blade
1—7⅞"— 3 blade
1—9⅞"— 3 blade
1—9⅞"— 2 blade

REED ROLLER

. . . .*with* REED BITS

WHEN THE CONTRACT CALLED FOR A HOLE NOT OVER 1° OFF VERTICAL IN THE NOTORIOUSLY HARD FORMATION AT BARBER'S HILL, TEXAS

ALL

REED DK ROCK BITS

EXCEPT ONE

WERE USED THROUGH SAND -- PYRITE -- SHALE -- LIME -- SAND ROCK AND SANDY LIME

from

2400 FEET

to

5182 FEET

REED ROCK BITS

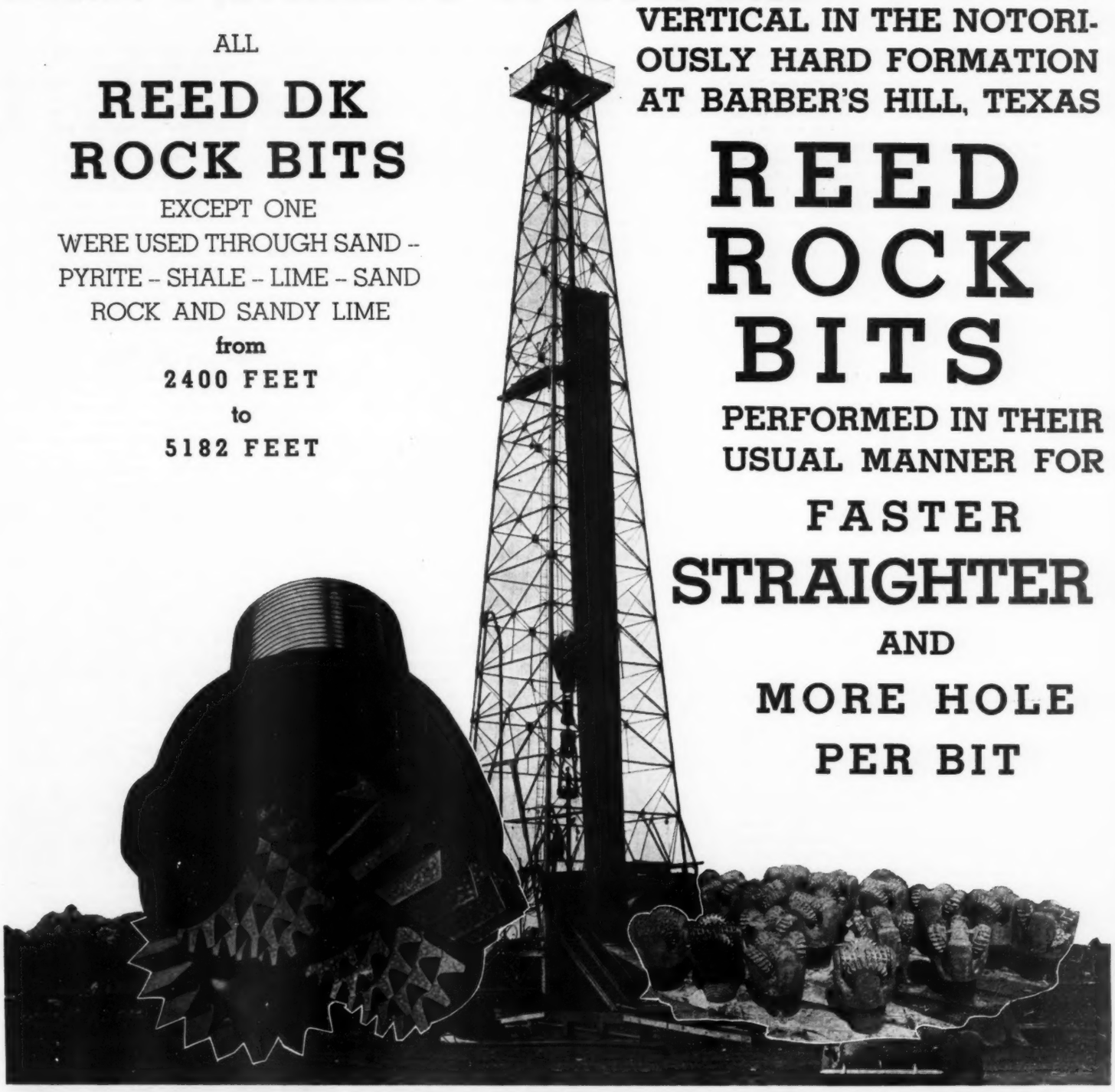
PERFORMED IN THEIR USUAL MANNER FOR

FASTER

STRAIGHTER

AND

MORE HOLE PER BIT



TRAVERSO NO. 1—O. W. DYER, CONTRACTOR

REED ROCK BIT COMPANY

Eastern Field Report

By STAFF CORRESPONDENT

Deep Gas Wells in Fayette and Beaver Counties, Penna.

PITTSBURGH, Pa., Mar. 28.—The second test of the Potter Development Co., William E. Snee and others on the Summit Hotel lease on Chestnut Ridge in South Union Township, Fayette County, is now considerably larger than No. 1. Continuing the record from last week at which the gauge was 308,000 feet a day at 6,755 feet, some additional gas was struck at 6,756 feet. At 6,763 feet, the gauge showed 1,200,000 feet a day with the samples showing mostly chert of larger size. The test was then shut in and the well rocked up to 2,985 pounds in eight hours with no increase in 24 hours. The pressure was then released and the well blown.

On the first run after blowing off the well, additional gas was struck bringing the gauge up to over 2,000,000 feet a day and at 6,367 feet the gauge was 3,400,000 feet a day. Drilling then became difficult as it was found impossible to keep water in the hole. At 6,768 feet, the well was shut in for orders and may not be deepened at present.

In the original test, the elevation was 2,316 feet with the top of the chert at 6,597 feet or subsea minus 4,281 feet. In No. 2, the elevation was 2,464 feet, with the top of the chert placed at 6,686 feet or subsea minus 4,222 feet, showing No. 2 to be 59 feet higher on structure. No. 2 is 12 feet deeper in the chert than No. 1 and as in No. 1 there is no showing of any sand at the various gas pays advancing the theory for the second time that the gas is picked up in fissures in a fractured Onondaga lime. No gas line as yet has been extended to the new well.

In Beaver County, Pennsylvania, another Oriskany test was completed which is showing for as large a well as any of the three previous completions. The T. W. Phillips Gas & Oil Co. and others completed a test on the James Smith farm in South Beaver Township which gauges slightly less than 4,000,000 feet a day. The Onondaga was struck at 4,338 feet and the Oriskany was topped at 4,552 feet, making a lime section of 214 feet, which compares closely with the discovery well of Galey and others on the Calvin (Graham) farm due north of this test. It extends the field considerably and enhances the value of the field in which additional drilling may now be expected.

Operations for the week continued at a low level with only 19 completions of which 5 were dry, 12 were gas wells, and 2 oil producers with an initial daily production of 32 bbls.

In Southeast Ohio, there is a paucity of new work and the best completion for the week was a gas well in Athens County where B. Anderson completed a test on the B. R. Ellis farm in the NE section 30, Rome Township, in Maxton sand at a depth of 1,047 feet. It gauges 1,000,000 feet a day and had a showing for a 10-bbl. oil producer in the first Cow Run sand. The rig was moved 50 feet southeast to drill for the oil in this formation.

In Cuyahoga County, Dillon, McFrederick and Schneider drilled a test on the M. C. Tueful farm in section 37, Parma Township, through the Clinton sand to 3,983 feet and it was a dry hole.

In Washington County, William Harris and others drilled a second test on the Glen Clift farm at Archers Fork in section 37, Independence Township, through the Warren sand to 3,000 feet.

SOUTHWEST PENNSYLVANIA

One oil well and one gas well were completed in Southwest Pennsylvania. In Center Township, Greene County, South Penn Oil Co. completed No. 12 Samuel Harvey in the Nineveh Thirty Foot sand. It is showing for 30 bbls. a day. The sand was topped at 3,151 feet.

In Richhill Township, Greene County, the W. L. Walters test on the Harry Clutter farm topped Big Injun sand at 1,700 feet, and the well gauged 2,000,000 feet a day at 1,700-17 feet, where drilling was suspended.

In Center Township, Greene County, Carnegie Natural Gas Co. is drilling at 2,314 feet in No. 3 J. H. Orndoff. J. B. Orndoff spudded in and started drilling the second test on the G. M. Scott farm.

In Greene Township, Greene County, O. I. Dille & Co. were drilling at 2,216 feet on the Jacob Livingood farm. Big Injun sand at 1,692-1,919 feet showed about 50,000 feet of gas. In Washington Township, Equitable Gas Co. is running 6⅝-inch casing to 1,863 feet in the second test on the Sadie A. Connor No. 2 farm. In Springhill Township, Taylor Oil & Gas Trust is drilling at 2,247 feet in No. 5 John Taylor.

Washington County

Little work is in progress in Washington County. In Nottingham Township, the Keystone Drilling Co. was drilling at 1,550 feet on the J. M. Balentine farm and in Cross Creek Township, Bloom and others were drilling at 1,960 feet on the F. L. Cummins farm.

In Buffalo Township, correcting the previous report, Ralph M. Duden is building a rig on the Antonio Provenzano farm.

Deep Tests

In Penn Township, Westmoreland County, Peoples Natural Gas Co. is down 50 feet and mixing mud to start drilling on the John S. Marshall farm northeast of Jeannette on the Grapeville anticline. This is being drilled with a rotary with Loffland Brothers the contractors.

In West Deer Township, Allegheny County, South Penn Oil Co. and others have the foundation set and are building the rig for the test on the Fred Backhaus farm which is also to be drilled with a rotary. Herndon Drilling Co. will be the contractor.

On Chestnut Ridge, north of the National Highway in Wharton Township, Fayette County, the test of the Greensboro Gas Co. on the J. R. Thompson farm is drilling at 3,450 feet. In North Union Township, the test of Wasson & Co. is down 1,350 feet. South along this ridge in Springfield Township, the L. J. Houze-Convex Glass Co. will start spudding the test on the Paul Dunham farm this week.

WEST VIRGINIA

The only new producer in West Virginia is No. 2 of Godfrey L. Cabot, Inc., on the Roane Land Co. tract in Malden district, Kanawha County. It was drilled through the Oriskany sand, which was dry, and is now plugged back to the Weir sand where it is estimated good for 2 bbls. a day.

Nine gas wells were added in the state. In Boone County, Owens-Illinois Glass Co. No. 29 Cassingham Coal Land Co. in Scott district had Berea at 2,299-2,319 feet, with 146,000 feet of gas at 2,303-09 feet, shut-in pressure of 424 pounds. In Washington district, Pond Fork Oil & Gas Co. test on its fee land produced 134,000 feet of gas per day from lime and shells at 2,020 feet. It may be deepened.

In Calhoun County, Guy Boggess and others completed a second test on the Allen Wilmoth farm in Sherman district as a gas well at 2,318 feet; Big Injun 2,263-2,300 feet, with 212,000 feet of gas after a shot at 2,273-93 feet.

In Clay County, Hope Natural Gas Co. completed No. 7796, H. B. Davenport farm, in Henry district, in Injun sand at 1,926 feet. It is a small gas well.

In Gilmer County, Center district, Phil D. Phillips completed No. 3 Belinda R. Fetty at 2,070 feet. Big Injun sand was at 1,829-1,912 feet with 241,000 feet of gas at 1,852-56 feet and 1,885-90 feet. In DeKalb district, Big Run Gas Co. drilled a test on the G. O. Bonnett farm but it had only a small volume of gas and is being abandoned. Total depth was 1,693 feet.

In Glenville district, Gilmer County, South Penn Oil Co., on the Guy Young farm, drilled through Fifth sand to 2,593 feet and it was dry. In the same district, Pittsburgh & West Virginia Gas Co. No. 7620, Virginia Floyd farm, drilled through Big Injun sand placed at 1,563-1,666 feet to 1,765 feet and it was dry.

In Kanawha County, Koontz and Osborne completed No. 6 Sarah C. Osborne, Big Sandy district, in Salt sand at 1,192 feet, and it is good for 555,000 feet of gas per day. In Washington district, Owens-Illinois Glass Co. completed No. 5 Silver Coal Land Co. at 3,290 feet as a gas well gauging 1,380,000 feet a day at a total depth of 3,776 feet.

In Monongalia County, Philadelphia Oil Co. completed No. 5408 on the Jacob A. Shane farm in Clay district at 3,264 feet as a good gas well. The Pittsburgh Coal was at 807-15 feet with 750,000 feet of gas from the Gantz and Bayard sands.

Oriskany Gas Field

Only one well was completed in the Kanawha County Oriskany gas field during the week. In Poca district, the United Fuel Gas Co. completed No. 4785, Otto B. Johnson land, at 5,100 feet with a final gauge of 11,159,000 feet a day. The Oriskany sand was topped at 5,062 feet.

No new locations were announced during the week. In Poca district, the United Carbon Co. topped the Corniferous lime at 4,847 feet and casing the test on the Eulah Miller and others farm at 4,863 feet. This company is drilling at 3,775 feet in William R. Young test, and 1,686 feet in the James S. Fisher test.

In this district, the West Virginia Gas Corp. topped Corniferous lime at 4,838 feet in the second test on the O. A. Vandine and others lease, and is drilling at 4,090 feet in the John and Sadie Dixon test. The Pitmar Gas Co. topped the same formation at 5,002 feet on the Albert Moore farm. Godfrey L. Cabot, Inc., reached that formation at 4,963 feet on the G. G. Dawson farm. The Liosag Fuel Co. is down 1,450 feet in No. 1 H. C. Matthews; Glenn Oil & Gas Co. at 1,000 feet in No. 2 James A. Haynes; D. H. Stephenson Co. at 1,360 feet in No. 1 Rozella Shamblin and others No. 1.

The United Fuel Gas Co. is drilling at 2,792 feet in No. 4771 B. A. Sisson; No. 4784 Oscar L. Gibson is at 3,000 feet, and No. 4790 W. H. Sisson is at 1,424 feet.

In Elk district, Columbian Carbon Co. is drilling at 1,600 feet in No. 1 Margaret Rayhill, and is rigging up the B. F. Jones test. The Cameron Oil & Gas Co. is down 2,310 feet in the Henry Hansel test.

In Union district, Columbian Carbon Co. is drilling at 1,685 feet on the Nelson H. Cavender farm. The West Virginia Gas Corp. is down 1,205 feet on the L. E. Layne and others lease.

Deep Tests

In Wood County, Belmont Quadrangle Co. was drilling at 600 feet on the C. D. White farm in Steel district. In the Harris district, Potter Development Co. has reached 650 feet on the W. H. Orem farm. In Ripley district, Jackson County, same company is fishing casing dropped at 1,856 feet in the test on the William T. Chancey farm. W. H. Petry is still fishing in the test on the D. O. Curry farm in Ravenswood district.

In Eagle district, Harrison County, the Shinnston-Lumberport Gas Co. is shut down at 6,267 feet on the E. E. Heldreth farm, 8 miles south of Mannington along the Marion County line.

New Work

In Cabell County, locations were made by the Lower Toms Creek Gas Co. on the Boyd and Eva

(Continued on Page 197)

California Field Report

By
L. P. STOCKMAN

11 New Wells in Wilmington Produce 29,500 Bbls. a Day

LOS ANGELES, Calif., Mar. 28.—The aggressive development program in the Long Beach Harbor section of the Wilmington field resulted in the completion of 11 wells with an aggregate initial production of 29,504 bbls. during the current week. There are 38 strings of tools in operation but a large number of drilling permits were recently issued indicating that the number of wells drilling will show a substantial increase, and within 30 days. General Petroleum Corp., Hancock Oil Co., Richfield Oil Corp., Superior Oil Co. and Union Pacific Railroad Co. are making preparations to increase field work. Richfield Oil Corp. took out drilling permits covering 26 wells to be drilled on a block of 100 acres comprising the Pacific Dock & Terminal property located north of Ship Channel 2, and the first group of these rigs should be erected within two weeks.

Union Pacific's new wells were Nos. 51, 70 and 71 and they registered initials of 6,480 bbls., 4,040 bbls. and 5,980 bbls. respectively. No. 51, bottomed at 3,986 feet, was finished with an 8⅝-inch liner landed at 3,463 feet to take care of production from the Upper Terminal zone, and 534 feet of 6⅝-inch liner landed on bottom to handle production from the Lower Terminal. The 8⅝-inch carried perforations at 3,094-3,442 feet and was cemented through perforations at 3,087 feet, while the 6⅝-inch carried 60-mesh perforations at 3,491-3,761 feet and at 3,791-3,986 feet and was cemented through perforations at 3,484 feet. No. 70 was completed at 4,025 feet and the hole finished with an 8⅝-inch liner landed at 3,637 feet and cemented through perforations at 3,108 feet and 399 feet of 6⅝-inch liner landed at 4,025 feet, and cemented through perforations at 3,660 feet. The 8⅝-inch included 60-mesh perforations at 3,115-3,616 feet and the 6⅝-inch carried perforations at 3,667-3,923 feet, 3,923-3,948 feet and at 3,949-4,025 feet. Union Pacific No. 71 was completed at 4,045 feet and the hole finished with an 8⅝-inch liner carrying perforations at 2,982-3,498 feet and 534 feet of 6⅝-inch liner including 60-mesh perforations at 3,542-3,810 feet and at 3,830-4,045 feet. The 8⅝-inch was cemented through perforations at 2,974 feet while the 6⅝-inch was cemented through perforations at 3,563 feet. Production from all three wells tested 28.2 degrees in gravity and was exceptionally clean.

Upper Terminal Well

Universal Consolidated Oil Co. completed No. 2 Newport flowing 4,000 bbls. of clean 26.4-gravity oil through 36/64-inch bean from the Upper Terminal zone, and clean 29.1-gravity oil through a 40/64-inch bean from the Lower Terminal zone. In accordance with a general understanding among operators the Ranger zone is not being produced.

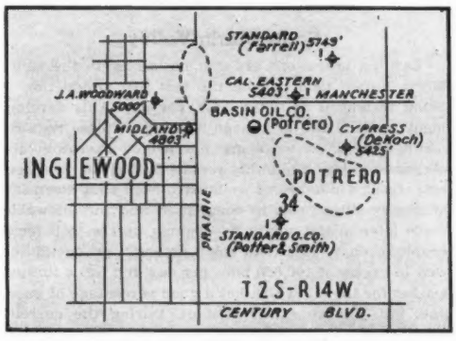
Hancock Oil Co. completed No. 3-A Harbor flowing 4,010 bbls. of clean 26.9-gravity oil daily from the Terminal zone at 4,050 feet. This new producer has perforations opposite the Upper and Lower Terminal zones from 2,881 feet to 4,050 feet and perforations opposite the Ranger zone between 2,355 feet and 2,790 feet.

Superior Oil Co. completed four new wells in the Ranger zone as they are located outside of what is at present considered the confines of the Terminal horizon. Superior No. 2 Ocean Front flowed 670 bbls. of 17.8-gravity oil from 2,900 feet and No. 1 Seaside flowed 550 bbls. of 17.9-gravity oil from 2,675 feet. No. 2 Back Bay flowed 542 bbls. of 17.7-gravity oil from 2,995 feet, while No. 3 Back Bay was completed flowing 405 bbls. of 17.8-gravity oil from 2,875 feet.

General Petroleum Corp., discoverer of the Wilmington field, completed No. 4 Southern Pacific, flowing 2,450 bbls. of exceptionally clean 25.9-gravity oil through a 42/64-inch and a 30/64-inch bean from a depth of 4,000 feet. It was finished with a combination of 8⅝-inch and 6⅝-inch oil string, landed at 3,990 feet and swedged at 2,887 feet. The string carried perforations at 2,446-2,806 feet, 2,938-3,429 feet, 3,510-3,870 feet and at 3,910-3,990 feet, and was cemented through perforations at 2,938 feet and 3,510 feet.

Caminol Co., Ltd., completed No. 2-7 Harbor flowing 377 bbls. of 17.3-gravity oil per day through a 26/64-inch beam from the Ranger zone at 2,980 feet after the hole had been carried down to 3,192 feet and plugged back to the completion depth. The hole was finished with 436 feet of 7-inch liner including 401 feet of 60-mesh screen landed at 2,980 feet and 2,971 feet of 2½-inch tubing with a packer.

Richfield Oil Corp. plugged back No. 1 Gurnsey from 6,078 feet to 2,970 feet preparatory to completing it in the Ranger zone. This deep hole found the Terminal and Ford zones entirely barren and thus limits future development in the immediate area to the upper or Ranger zone.



Basin Oil Co. is making preparations to drill a wildcat about midway between the two productive areas in the Potrero field of Los Angeles Basin

Montebello

St. Helens Petroleum Co., which proved up the existence of substantial production in rocks of Miocene age in the extreme western end of the Montebello field in December, 1937, followed up this discovery during the current week by discovering an intermediate zone in the Pliocene. The company made a formation test on No. 24 Monterey a few days ago with the bottom of the hole at 5,550 feet and the formation tester at 5,404 feet and open for 20 minutes. Gas reached the surface in three minutes and fluid reached the surface seven minutes later. The formation test indicated that the well is capable of flowing 1,500 bbls. of clean 34.3-gravity oil and approximately 10,000,000 feet of gas per day. It is the intention of the company to core ahead and make another formation test with additional hole open. The bottom-hole pressure in No. 24 Monterey is 1,400 pounds. This zone, which is in the Pliocene, above the Miocene contact, was logged in No. 20 Monterey, the deep zone discovery well, but was cased off with blank pipe. No. 20 Monterey was completed flowing 1,500 bbls. per day from 6,353 feet with only a limited penetration taken in the Miocene. The new zone tested out by St. Helens this week extends from approximately 5,400 feet to 5,900 feet, but it remains to be seen whether it carries any intermediate water or contains bottom water at the base of the zone. This productive measure is very deceptive and looks very much like a water sand instead of an oil sand. Standard Oil Co. drilled a deep well approximately 2,500 feet west of No. 20 Monterey several years ago but failed to develop commercial production. It is possible that this zone was either mudded off or deemed unproductive because of its appearance. Drilling operations in the Montebello field will undoubtedly show a substantial increase later in the year as soon as the productive limits are defined and additional flowing wells completed. The result of the formation test conducted a few days ago by St. Helens Petroleum Co. on No. 24 Monterey has greatly stimulated interest and will undoubtedly result in the starting of several new wells. St. Helens has three drilling wells under way and Union Oil Co., Brookline Oil Co. and McVicar & Rood one each. In addition Union Oil Co. is preparing to spud in No. 1 Wilcox, an easterly offset of the same company's No. 1 Paul Howard.

Kettleman Hills

Standard Oil Co. has just cemented 10,715 feet of 6⅝-inch casing in No. 27-21-J in the Kettleman North Dome field preliminary to making a production test in the immediate future. The bit in this well, which is located in section 21-21-17, picked up the top of the Avenal sand of Eocene age at 10,720 feet and an exceptionally rich oil sand was found in the present bottom of the hole at 10,735 feet. This is the third well that has been carried down to the Avenal zone, but Kenda's No. 67-20-J in section 21-21-17 should also log this deep zone in the immediate future. No. 4-18-J of Kettleman North Dome Association (Kenda) proved this zone productive last year and was recompleted a short time ago as a commercial producer after having been deepened. Superior Oil Co. completed No. 5 Huffman in the Avenal zone early in February, flowing 600 bbls. of exceptionally clean 45.8-gravity oil and 22,857,000 feet of gas per day from 10,746 feet. Bandini Petroleum, a subsidiary of Wilshire Oil Co., has suspended No. 5 Whepley at 9,506 feet due to the inability to maintain a vertical hole. This well, located far out on the north flank of the Kettleman structure in the Felix area, was being deepened from the Temblor zone to the Avenal zone. The company has not indicated whether the lease will be quitclaimed or a new hole started. In section 11-22-17 Standard Oil Co. No. 2-11-P is flowing salt water from 7,850 feet and orders have been issued to place it on the suspension list. Because of the existing overproduction situation operators in Kettleman North Dome field are retarding development of the Avenal zone of Eocene age and will probably continue to restrict deep zone developments in this field for several months.

Greeley

Superior Oil Co. has a problem on its hands in connection with wildcat exploration a few miles southeast of the Greeley field deciding whether to drill another test well or pull out of the entire area. This has arisen because its first wildcat was completed flowing 750 bbls. per day for a short time and then went to water. This well could never be recompleted due to water trouble. Superior Oil Co. then drilled a second test southwest of the first wildcat but failed to find anything and the hole was accordingly abandoned. The company then went back into the first wildcat, No. 9 Kern County Land in section 3-30-26, and whipstocked the hole to the northeast. On a test this week the hole, deviated to the northeast and redrilled to 7,800 feet, showed salt water and mud but no oil. As a result of this unfavorable formation test it is being abandoned and brings up the problem regarding future disposition. Standard Oil Co. completed one new well in the Greeley field in the past week but this was offset to some extent by the abandonment of two drilling wells that failed to result in commercial production. The company's new producer was No. 1 Calder-Klassen in section 20-29-26 and was completed flowing 1,042 bbls. of 35.9-gravity oil, 2,510,000 feet of gas and 4 bbls. of water per day from 7,794 feet through a 1-inch bean. Current production is coming from 7,750 feet in as much as the hole was

plugged back from 7,794 feet previous to completion. Standard Oil Co.'s two abandonments were No. 11-12 Kern County Land in section 20-29-26 and No. 12-4 Kern County Land in section 16-29-26. The former was abandoned in a gray sand at 7,985 feet after having found the Greeley sand barren. Top of the gray sand was cored at 7,965 feet and top of the Greeley zone was logged at 7,880 feet. No. 12-4 Kern County Land failed to show anything from the grass roots down to bottom of the hole at 8,253 feet. Shell Oil Co.'s outpost in the Greeley field, No. 1-B-76 in section 16-29-26, has just passed the 6,000-foot level and still has some distance to go before reaching the top of the Greeley sand.

North Belridge

In the North Belridge field Belridge Oil Co. completed No. 7 in section 27-27-20, flowing 552 bbls. of clean 34.4-gravity oil and 7,180,000 feet of gas per day from 8,466 feet. It was finished in the Wagonwheel zone of Eocene age, completed with 470 feet of 4¾-inch liner including 432 feet of 250-mesh screen landed on bottom, and production is flowing through a 1½-inch bean under a tubing pressure of 160 pounds and a casing pressure of 910 pounds. Tide Water Associated Oil Co. completed No. 1 fee in section 21-27-20 flowing 196 bbls. of 33.5-gravity oil cutting 7 per cent and 798,000 feet of gas per day from 8,640 feet. This well, which was finished with 1,081 feet of 4¾-inch liner, including perforations at 8,099-8,145 feet, 8,211-8,517 feet and at 8,590-8,636 feet and cemented through perforations at 8,114 feet, is flowing through two 96/64-inch beans and shows a tubing pressure of 140 pounds and a casing pressure of 2,300 pounds. The hole showed some evidence of faulting and this irregularity in subsurface strata may be the cause of the comparatively small production. Richfield Oil Corp. No. 1-A Belridge has already passed the 8,125-foot level.

Coastal Area

Tide Water Associated Oil Co. extended the eastern limits of production in the Ventura Avenue field by completing No. 41 Ventura Land & Water, flowing 1,274 bbls. of 23.5-gravity oil and 1,360,000 feet of gas per day through a 3-inch bean from 7,303 feet. This well, the most easterly in the field, was finished with 591 feet of 6⅝-inch liner including 527 feet of perforated landed at 7,298 feet. The company's No. 18 Hartman, which was recently given a production test with satisfactory results, has been taken off production and drilling operations have been resumed. The hole is now down 10,388 feet and drilling. It failed to to flow during the recent test at 10,090 feet but responded when put on a compressor and showed a production of 1,016 bbls. per day.

In the Rincon field of Ventura County General Petroleum Corp. employed a new method of completion when finishing No. 3 Ferguson last week by gravel-packing the oil zone and dispensing with the oil string. This is the first instance where a well has been packed with gravel without the use of an oil string. The hole was packed with ⅛-inch gravel from 2,985 feet to 3,117 feet and finished with 2,743 feet of 3-inch tubing. Chanslor Canfield Midway Oil Co. is making preparations to completed No. 20-B Hobson in the Rincon field.

Santa Maria Valley

Drilling operations are still increasing in the Santa Maria Valley field despite the fact that production is being restricted to 10,000 bbls. per day. This development work is due in a large measure to lease requirements because if wells are not drilled operators are obligated to pay a monthly rental. During the past several weeks a number of wells have been shut down immediately subsequent to completion and the allowable made later in the month by opening up the well for a couple of days. This field has a potential production of well in excess of 100,000 bbls. per day, but has a limited market for the oil, which has a good percentage of gasoline, but a large sulfur content. During the current week California Lands, Inc., completed No. 3 Jones-Gallison in section 26-10-34 pumping 675 bbls. of clean 13.2-gravity oil per day from 5,515 feet. It was finished with 675 feet of 6⅝-inch liner including 637 feet of perforated landed at 5,514 feet. York Oil Co. No. 2 Doane, completed at 4,571 feet, came in flowing 1,480 bbls. of clean 14.7-gravity oil per day. It topped the Franciscan basement at 4,566 feet and was finished with 440 feet of perforated 7-inch liner landed on bottom.

In the Gato Ridge field of Santa Barbara County Moyle Petroleum Co. completed No. 1 Gato Ridge pumping 635 bbls. of clean 15.9-gravity oil per day from 3,792 feet after the hole had been finished with 1,635 feet of 8⅝-inch liner including 1,157 feet of 250-mesh screen landed on bottom. It will undoubtedly increase production after it gets under way.

In the Lompoc district of the Santa Maria field, A. E. Bell completed No. 4 Lompoc in section 33-8-34 at 2,760 feet after plugging back the hole from 3,178 feet but the well was good for only 25 bbls. of 15.8-gravity oil per day.

Los Angeles Basin

Standard Oil Co. completed a new well in the Richfield district this week when No. 2-26 Kraemer was brought in pumping 172 bbls. of 21.1-gravity oil and 23 bbls. of water per day from 4,550 feet after the hole had been finished with 628 feet of 6⅝-inch perforated liner landed at 4,548 feet. In the Torrance field where operators are engaged in a deepening campaign Superior Oil Co. has completed its No. 5 Torrance and Harry Fisher succeeded in recompleting No. 1 Watkins pumping 35 bbls. of 26.8-gravity oil daily from 5,150 feet. Superior Oil Co. No. 5 Torrance was recompleted pumping 210 bbls. of very clean 26.3-gravity oil per day from 4,959 feet. The hole was finished with 1,540 feet of blank liner cemented on bottom and then gun perforated between 4,822 feet and 4,959 feet.

Kern County

Continental Oil Co. has reached a depth of 14,804 feet in its Wasco wildcat but has not yet passed out of the shale body that has been present for the past 475

(Continued on Page 226)

TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS

	March 18		March 11			
	Total this week	Daily average	Total last week	Daily average	This week to date	Same time last year
Intercoastal-domestic:						
Crude oil	70,180	10,026	.....	.....	70,180	.....
Diesel and gas oil	.....	.....	.....	.....	.....	176,726
Gasoline	.....	.....	117,380	16,769	461,496	286,012
Kerosene	.....	.....	72,690	10,384	132,575	.....
Foreign exports:						
Crude oil	385,021	55,003	654,709	93,530	4,866,818	2,442,333
Fuel oil	290,159	41,451	217,339	31,048	1,748,717	2,664,428
Diesel and gas oil	46,397	6,628	183,856	26,265	984,822	1,558,161
Gasoline	88,241	12,606	.....	.....	1,114,320	1,406,442
Kerosene	42,610	6,087	2,291	327	211,063	588,107
Other unfinished oil	.....	.....	.....	.....	.....	179,265
Coastwise-domestic:						
Crude oil	130,909	18,701	214,961	30,709	2,192,970	1,167,829
Fuel oil	129,614	18,516	345,726	49,389	2,749,479	3,204,340
Diesel and gas oil	48,301	6,900	22,363	3,195	353,624	512,259
Gasoline	296,206	42,315	267,760	38,251	3,061,393	2,332,774
Kerosene	18,764	2,681	.....	.....	61,520	28,295

TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic:						
Diesel and gas oil	.....	.....	.....	.....	178,662	152,932
Gasoline	.....	.....	.....	.....	.....	25,778
Foreign exports:						
Crude oil	.....	.....	.....	.....	760,177	829,591
Fuel oil	.....	.....	.....	.....	256,214	324,581
Diesel and gas oil	.....	.....	.....	.....	181,973	666,576
Gasoline	97,263	13,895	.....	.....	975,680	1,261,749
Kerosene	.....	.....	.....	.....	110,450	165,359
Lubricants	.....	.....	.....	.....	82,632	151,311
Coastwise-domestic:						
Fuel oil	123,787	17,684	169,177	24,168	1,432,246	1,458,191
Diesel and gas oil	31,216	4,459	18,605	2,658	382,622	122,031
Gasoline	135,606	19,372	130,214	18,602	1,447,530	1,076,806
Kerosene	16,948	2,421	20,986	2,998	192,031	21,509

STANDARD OIL CO. OF CALIFORNIA AND UNION OIL CO

Crude oil prices at the well effective June 22, 1936

Gravity—	Signal Hill (Long Beach)	Seal Beach	Alamitos Heights	Huntington Beach	Inglewood	Playa del Rey	Olinda-Brea Canyon	Athens-Rosecrans	Domingues	Elwood Terrace	Torrance	Richfield	Whittier E. Coyote (La Habra)	Montebello	W. Coyote Hills	Santa Fe Springs	Mountain View	Elk Hills Buena Vista Hills Midway-Sunset Lakeview Area	Lost Hills	Coalinga	Wheeler Ridge	Kettleman Hills	Santa Paula*	Orcutt*
14-14.9	$.80	$.79	$.74	$.78	$.79	$.80	$.76	...	...	...	$.80	$.76	$.76	$.77	$.78	...	...	$.70	$.70	$.70	...	...	$.70	...
15-15.9	.80	.79	.74	.78	.79	.80	.76	...	...	...	.80	.76	.76	.77	.78	...	...	.70	.70	.70	...	...	.70	...
16-16.9	.80	.79	.74	.78	.79	.80	.76	...	...	...	.80	.76	.76	.77	.78	...	...	.70	.70	.70	...	...	.70	$.70
17-17.9	.80	.79	.74	.78	.81	.80	.76	...	...	...	.80	.76	.76	.77	.78	...	...	.70	.70	.70	...	...	.71	.70
18-18.9	.80	.79	.74	.78	.84	.80	.78	...	...	...	.82	.76	.76	.77	.78	...	...	.70	.70	.70	...	...	.73	.72
19-19.9	.82	.79	.74	.82	.87	.84	.81	...	...	...	.85	.76	.78	.77	.78	...	$.70	.74	.74	.71	$.70	...	.75	.74
20-20.9	.85	.79	.74	.85	.90	.88	.84	...	...	...	.88	.78	.82	.77	.80	...	.70	.78	.78	.72	.70	...	.77	.77
21-21.9	.88	.79	.74	.89	.93	.93	.88	...	...	...	.91	.80	.85	.77	.84	$.78	.73	.82	.82	.74	.70	...	.79	.80
22-22.9	.92	.82	.74	.92	.96	.98	.92	...	...	...	.93	.84	.89	.79	.88	.78	.77	.87	.86	.78	.72	...	.82	.83
23-23.9	.95	.86	.77	.96	.99	1.02	.96	$.84	$.79	...	.96	.88	.93	.82	.92	.78	.80	.92	.90	.82	.76	...	.85	.86
24-24.9	.99	.91	.80	1.00	1.02	1.06	.99	.88	.81	...	.99	.91	.96	.85	.96	.82	.84	.97	.94	.86	.79	...	.87	.88
25-25.9	1.03	.95	.82	1.03	1.05	1.11	1.03	.93	.83	...	1.02	.95	...	.89	.99	.86	.88	1.01	.98	.90	.83	...	.90	.91
26-26.9	1.06	1.00	.85	1.07	1.09	1.16	1.06	.98	.86	...	1.05	.98	...	.92	1.03	.90	.91	1.06	1.02	...	...	...	.92	.93
27-27.9	1.10	1.05	.88	1.11	1.12	...	1.10	1.03	.88	...	...	1.02	...	.96	1.06	.95	.95	1.10	1.06	...	...	...	.95	...
28-28.9	1.14	1.10	.90	1.14	1.15	...	1.14	1.07	.90	...	...	1.06	...	.99	1.10	.99	.99	1.15	1.10	...	...	...	.97	...
29-29.9	1.17	1.15	.93	1.18	1.18	F.O.B.	1.17	1.12	.93	...	...	1.09	...	1.03	1.14	1.03	1.02	1.20	1.14	...	...	...	.99	...
30-30.9	1.21	1.19	.95	1.22	1.21	our	1.21	1.17	.95	F.O.B.	...	...	...	1.07	1.17	1.08	1.06	1.25	1.18	...	...	...	1.01	...
31-31.9	...	...	...	...	1.24	Pipe	1.24	1.22	.97	Ship	...	...	...	1.11	1.21	1.12	1.09	1.29	...	...	...	...	...	...
32-32.9	...	...	...	...	1.27	Line	1.27	1.27	1.00	...	...	...	...	1.14	1.25	1.16	1.13	1.34	...	...	...	...	...	...
33-33.9	...	...	...	...	...	...	...	1.32	...	$1.28	...	...	...	1.18	1.28	1.20	1.17	1.38	...	...	...	$1.19	...	...
34-34.9	...	...	...	...	...	...	...	1.37	...	1.32	...	...	...	1.22	1.32	1.25	1.20	...	...	...	...	1.23	...	...
35-35.9	...	...	...	...	...	...	...	1.42	...	1.35	...	...	...	1.25	...	1.29	...	...	...	...	...	1.27	...	...
36-36.9	...	...	...	...	...	...	...	1.46	...	1.39	...	...	...	1.29	...	1.33	...	...	...	...	...	1.31	...	...
37-37.9	...	...	...	...	...	...	...	1.51	...	1.43	...	...	...	1.32	...	1.37	...	...	...	...	...	1.35	...	...
38-38.9	...	...	...	...	...	...	...	1.56	...	...	...	...	...	1.36	...	1.42	...	...	...	...	...	1.39	...	...
39-39.9	...	...	...	...	...	...	...	1.61	...	...	...	...	...	1.40	...	...	...	...	...	...	...	1.43	...	...
40-40.9	...	...	...	...	...	...	...	1.66	...	...	...	...	...	1.43	...	...	...	...	...	...	...	...	...	...

Newhall, McKittrick, Kern River, Kern Front and Round Mountain, 70 cents for all grades. *Posted by Union Oil Co. Same company's Brea Canyon schedule stops at $1.14 for 28 degrees and over, and Belridge and Lost Hills schedule stops at $1.32 for 37 degrees and over. By Standard Oil Co., effective October 15: El Segundo, 14 to 18.9 degrees, 80 cents; 19-19.9, 82 cents; 20-20.9, 85 cents; 21-21.9, 88 cents; 22-22.9, 92 cents; 23-23.9, 95 cents; 24-24.9, 99 cents; 25-25.9, $1.03; 26-26.9, $1.06; 27-27.9, $1.10; 28-28.9, $1.14; 29-29.9, $1.17; 30-30.9, $1.21. Wilmington, 14 to 16.9, 75 cents; 17-17.9, 77 cents; 18-18.9, 79 cents; from 19 degrees upward, prices same as Signal Hill.

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Among Gulf Coast Drilling Contractors

Loffland Brothers received contract from Pan American Production Co. for an 8,000-foot wildcat on a block of approximately 250,000 acres located in Pierce County, Georgia. This will be the deepest test ever drilled in that state. The same firm abandoned an outpost test drilled in the Abbeville field, in South Louisiana for the Continental Oil Co. and received contract for another test.

Jack Frazier is rigging up his second test in the Eureka Heights field, adjoining the Houston city limits where he converted this gas field into an oil field with the completion of his No. 1 Neiman-Vollmer. The well was completed in the Upper Saline Bayou formation and had an initial flow of 25 bbls. per hour through a ¼-inch choke. The new test is located about 750 feet south of the discovery well on the Varner Realty Co. tract. This is the second strike along the Gulf Coast made by Frazier and was accomplished in an area which was condemned due to several dry holes which had been drilled on the structure. In the meantime drilling continues at the Hardin field in Liberty County where his No. 2 Lynott and Buffam is below 3,500 feet.

Trinity Drilling Co. opened a shallow discovery in Jackson County for H. J. Potter with the completion of No. 1 Foust. Production was obtained by perforating the casing in the Miocene section at 2,642-57 feet, and the well had an initial flow of 177 bbls. of 23-gravity oil per day through a 5/32-inch choke. The area is divided into many ownerships and a lively drilling program is anticipated if the well maintains a steady production.

Superior Drilling Co. made a drillstem test in its No. 1 Paul Kruger, 4,500 feet southwest of the McCrosky discovery well in Matagorda County, and drilling operations were shut down after it tested salt water. In Wharton County, Texas Crusader and others No. 4 Kubella, Pickett Ridge field, has been spudded.

Sid Richardson of Fort Worth has moved in one of his rigs to the Fairbanks field, Harris County, where No. 1 J. P. Dawson has been spudded for Henry C. Adams. Several locations have been made by the same operator, all of which are expected to be drilled with the same rig.

L. W. Capps received contract from Petroleum Heat & Power Co. for a wildcat to be drilled on the J. J. Cahill lease in the J. M. Barrerra Survey, about 3 miles southeast of Wellborn.

Wynne Crosby Drilling Co. abandoned Cockburn and others No. 1 Hudgins at 7,530 feet. The test is a wildcat located in the Hungerford area in Wharton County. In the same county and located in the Lissie area, Strake Petroleum Co. No. 1 Poole, a projected deep test, is drilling below 2,700 feet.

Housh, Schofield and Thompson abandoned two interesting wildcats. In the Hitchcock field, No. 1 Stewart Title Guaranty Co., an outpost test, was abandoned at 6,611 feet, while in the Winnie area, Chambers County, Laverne Decker and others No. 1 Broussard was abandoned at 7,580 feet.

Nicklos Drilling Co. has reached the sand on two wells in the Villa Platte field, Evangeline Parish, and production tests were scheduled to be made the first of the week. The wells are being drilled for the Continental Oil Co. and if productive will extend the field a quarter mile south and west. Drilling continues with three rigs at the Valentine field, for the Pan American Production Co.

General view of Jack Frazier No. 1 Neiman-Vollmer located in the pine woods just outside of the Houston city limits which opened the first oil production for the Eureka Heights gas field last week

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Southwest Texas District

By
F. L. SINGLETON

New Pay in Well Extending West Saxet Pool in Nueces

CORPUS CHRISTI, Tex., Mar. 28.—Opening of two important extensions to the active West Saxet field, Nueces County, and the testing of several prospective pool openers along the Balcones Fault line district were the highlights of development in the Southwest Texas district the past week.

Rand Morgan No. 1 fee opened a new horizon and extended production of the West Saxet field, Nueces County, approximately 5,800 feet due south when it flowed 10 bbls. per hour through a 5/32-inch choke with tubing pressure 875 pounds and casing pressure 1,105 pounds. The new sand was logged last week by a Schlumberger survey at 5,641-61 feet, and the well was completed through perforated casing at 5,649-53½ feet. The hole was drilled to a total depth of 5,865 feet and found the discovery sand at 5,800 feet faulted out. Interest in the field is now centered on Heep Oil Corp. No. 1 McKinzie, 2,700 feet northeast of production. Sand showing oil was logged at 5,809-21 feet and casing was being cemented for a production test. It is located in the southern part of a 31.6-acre tract in the B.S.&F. Survey 419.

North of the discovery well, two producers were completed by Phillips Petroleum Co. No. 3 McKinzie flowed 260 bbls. per day through a 5/32-inch choke from perforated casing 5,817-20 feet, and No. 2 McKenzie was completed through perforated casing at 5,817-20 feet and flowed 266 bbls. per day through an 11/64-inch choke. The same company's No. 1 Clark, a west offset to the discovery, reperforated casing at 5,821-24 feet and flowed 72 bbls. in four hours through a ¼-inch choke. The flow was free of salt water which appeared last week when the well was tested through perforations at 5,824-27 feet.

New Wells in New Pool

Two producers were being completed in the newly opened Alfred field, Jim Wells County, which will extend production southwest and northwest. Smith & Storey No. 1 Robert Adams, 1,100 feet northeast of the discovery was flowing into the tanks ungauged after perforating the casing at 3,248-54 feet. It was showing 540 pounds of pressure while flowing through a ¼-inch choke. Southwest of the discovery about 510 feet, Rowan and Hope No. 2 Adams was flowing into the tanks through a ¼-inch choke, having a casing pressure of 600 pounds. No gauge was available on the amount of fluid it was making. East of the discovery, Gilcrease Oil Co. was moving in a rig for No. 1 Robert Adams in Block 28, Survey 5, about 1,000 feet due east.

Several trades which call for drilling obligations are reported to have been made and an increase in drilling activity is expected to be started within the next few weeks.

In the East Premont field, Magnolia Petroleum Co. is preparing for a production test in No. 8 Seeligson. Gas sand was logged at 6,552-60 feet and oil sand at 6,560-92 feet. The sand was found at about the same depth from which the company's No. 7 Seeligson was completed in December of last year. The present test is located 1,270 feet north and 50 feet east of the discovery and in the Los Jobonellios Survey.

The southeast side of the East White Point structure, San Patricio County, was apparently defined by the showing of Smith Drilling Co. No. 1 French which is shut down at 5,713 feet after testing salt water on a drill stem test in the discovery horizon. The test lasted 15 minutes and was made at 5,682-95 feet, showing 270 feet of oil mud and 2,350 feet of salt water with 12 pounds of pressure. Location is 3,000 feet from the discovery in section 65 of the Henry S. Day Survey. Plymouth Oil co., which discovered the field several weeks ago, has started drilling operations on three wells, all being offsets located on the Kellog, Nelson and Owens tracts.

Benavides Extension

Another important extension was apparently marked up for the active Benavides field, Duval County, by the showing of Hiawatha Oil & Gas Co. No. 9 Parr, approximately a half mile east of production. The Pettus or Cockfield sand showing oil was topped at 5,513 feet and cored to a total depth of 5,518 feet, where a 15-minute drill stem test showed 375 feet of oil and 45 pounds of pressure. A small amount of salt water was recovered and the hole will no doubt be plugged back several feet before the completion is made. Seven-inch casing was cemented on bottom.

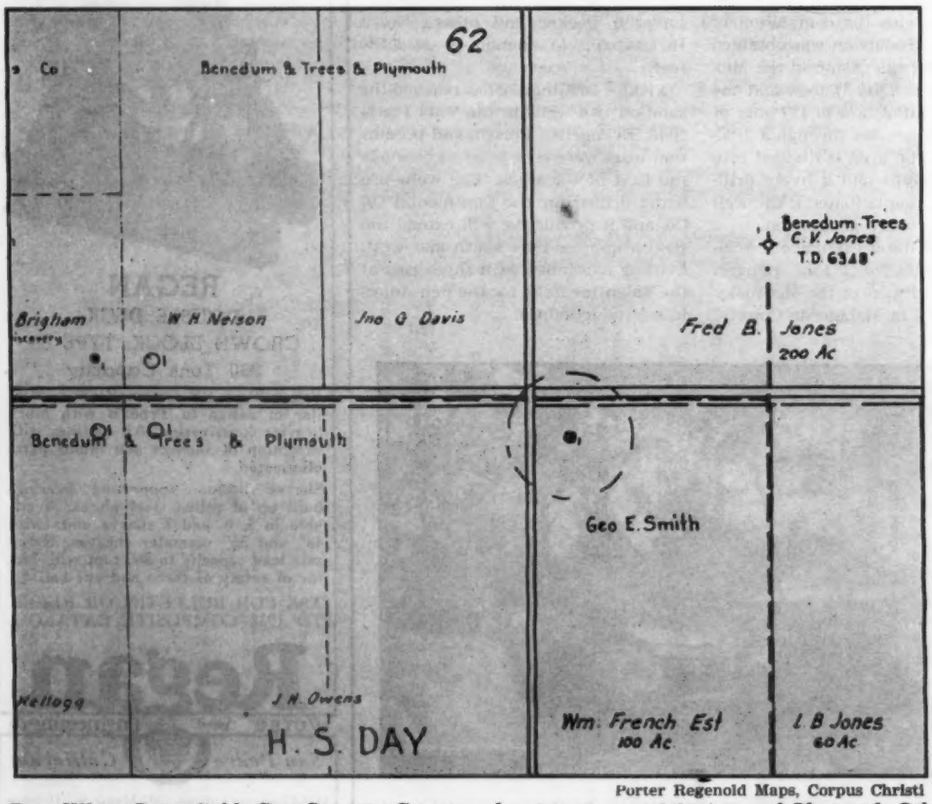
Locations for three more wildcats were staked in the county along the same trend as the Benavides field. Mills Bennett Production Co. and Stanolind Oil & Gas Co. have spudded No. 1-A Ira Yates, J. Poitevent Survey No. 321. Five miles west of San Diego in the B.S.&F. Survey No. 303, Corpus Christi Refining Co. is rigging up No. 1 Parr, while northwest of Freer, Magnolia Petroleum Co. staked location for No. 1 Duval County Ranch Co. in the C.C.S.D.&R.G.N.G. Survey No. 87. Since the discovery of the Benavides field last year, which opened the first important Cockfield production in the Laredo district, an active geophysical program has taken place which has resulted in wildcat operations throughout the county. One important wildcat was marked off the list the past week when Atlantic Refining Co. quit No. 1 Gravis at 5,833 feet. The well is located southwest of San Diego in the E. D. Gravis Survey. The Cockfield was logged at 5,666-74 feet and the only showing was reported to have been in the top of the section. The showing indicates the presence of structure and additional exploration is expected in this area.

Ezzell Field

Prospects of a new sand discovery which will result in a mile east extension to the active Ezzell field in McMullen and Live Oak counties encouraged operators in that field. The well is being drilled by Sam E. Wilson on the Great Southern Life Insurance Co. lease located in section 47, Block 2456, of the W. Duty Survey. Sand showing oil was cored at 1,855-71 feet, and 7-inch casing was cemented at 1,906 feet after a Schlumberger survey was made. This is believed to be the Pettus sand and the showing was encountered approximately 400 feet deeper than the discovery horizon which is logged from 1,450-1,530 feet.

In the Mercedes field, Hidalgo County, Union Sulphur Co. completed No. 12 American Rio Grande for an initial production of 80 bbls. of 60-gravity distillate per day through a ⅜-inch choke. Sand was logged at 7,469-81 feet. This is the first activity started in this field in several months.

Along the Balcones Fault line district interest was centered on several wildcats which are preparing to test or have reported to have logged encouraging showings. Two miles northeast of Sullivan in the Samuel Highsmith Survey, Guadalupe County, H. G. Spiller No. 1 Wright is bottomed in the Austin chalk at 2,167 feet and 5½-inch casing was cemented at 2,012 feet. The chalk is reported to have carried oil in the upper section.



Porter Regenold Maps, Corpus Christi

East White Point field, San Patricio County, showing new activity around Plymouth Oil Co. No. 1 Brigham the discovery well. George E. Smith No. 1 French (indicated by circle) is shut down at 5,713 feet after testing salt water in the discovery horizon

In Medina County, Ewing Oil Co. No. 1 Riff has uncovered a Serpentine plug prospect 2 miles south of Dunlay. Hard sandy lime with an oil showing was logged at 528-48 feet, and saturated Serpentine was logged at 548-80 feet. The hole is being cored ahead and it will no doubt be carried deeper to the Edwards lime before a test is made.

In Williamson County, Marion Aldridge No. 1 Krischewsky, Samuel Pharrass Survey, logged streaks of Adobe lime showing oil at 110-33 feet, the total depth, and 7-inch casing was cemented at 971 feet for a production test.

COMPLETED WELLS

Completed wells in proven Southwest Texas fields, with their total depth and the initial 24-hour production of the producing wells were as follows:

Aransas County

McCampbell field: Atlantic Refining Co. No. 3-C Porterfield, 7,236 feet, 168 bbls., ⅛-inch choke; Trusca Oil Co. No. 2 E. V. Murray, 7,123 feet, perforated casing 6,788-96 feet, 4 bbls., 3/32-inch choke.

Caldwell County

Luling field: C. H. Mee and McNeil Petroleum Co. No. 4 Crosby, 2,118 feet, 5 bbls. pumping. Salt Flat field: L. H. Wilson No. 1 Cooke, 2,552 feet, 98 bbls., pumping.

Duval County

Benavides field: Arkansas Fuel Oil Co. No. 1 Wolfe, 5,381 feet, 74 bbls., in six hours, ¼-inch choke; Benedum and Trees No. 12 Puig, 4,770 feet, 172 bbls., 5/32-inch choke; Glenn H. McCarthy No. 4 Placker, 5,372 feet, completed as gas well; Navarro Oil Co. No. 2 West, 5,334 feet, 150 bbls., ¼-inch choke; Republic Production Co. No. 5-A Buoy, 3,905 feet, 146 bbls., ⅛-inch choke. Charmousa field: N. V. Duncan No. 18 Worden, oil sand 1,538-42 feet, 60 bbls., pumping. Lundell field: Government Wells Oil Co. No. 18 Lundell, oil sand 1,498-1,507 feet, 8 bbls. per hour, ¼-inch choke.

Hidalgo County

Sam Fordyce field: K. D. Harris No. 1 Guerra, 3,080 feet, perforated casing 2,844½-49½ feet, 30 bbls. oil, some salt water.

Jim Wells County

Premont field: Miss-Texas Oil Co. No. 1 Premont, 2,358 feet, 40 bbls. oil, 500 bbls. fresh water, jetting.

Live Oak County

Ezzell field: Bleak Oil Co. No. 2 Viteri, 1,567 feet, 165 bbls., ⅜-inch choke; Bleak Oil Co. No. 3 Viteri, 1,529 feet, 88 bbls., pumping; Bleak Oil Co. No. 4 Viteri, 1,518 feet, 59 bbls., pumping; E. M. Jones No. 8-B Ezzell, 1,488 feet, 118 bbls., ¼-inch choke; E. M. Jones No. 5-F Ezzell, 1,504 feet, 55 bbls., open tubing; Parr and Delaney Oil Co. No. 9 Hill, 1,499 feet, 35 bbls., pumping; Sure Oil Co. No. 3 Ford, 1,532 feet, perforated casing 1,526-30 feet, 51 bbls. oil, 22 bbls. salt water, ¼-inch choke. Rhodes field: Argo Royalty Co. No. 1-C Edrington, 3,528 feet, gas well.

Nueces County

Agua Dulce field: Union Producing Co. No. 1 Golliday, 8,190 feet, perforated casing 6,730-40 feet, 2,500,000 feet of gas and 36 bbls. distillate, 3/16-inch choke; Union Producing Co. No. 1 Perkins, 4,902 feet, 12,568,000 feet of gas. Luby field: Richardson Petroleum Co. No. 1 Cowles, 7,370 feet, abandoned; Seaboard Oil Co No. 15 Luby, 5,072 feet, perforated casing 5,066-71½ feet, 120 bbls., ⅛-inch. choke. Richard King field: Southern Minerals Corp. No. 5 King, 4,037 feet 10 bbls., 3/16-inch choke. Saxet field: Houston Oil Co. No. 35 Morgan, 4,553 feet, 74 bbls., 20 per cent salt water, ¼-inch choke. West Saxet field: C. Andrade No. 1 Dunn, 5,832 feet, perforated casing 5,814-22 feet, 243 bbls., 4 per cent salt water, 5/32-inch choke.

Webb County

Killam field: O. W. Killam No. 4-B Garcia, 1,982 feet, 60 bbls., ⅝-inch choke. Ohern field: J. J. O'Hern No. 4 Benavides, 2,737 feet, oil sand 2,733-36 feet, 100

(Continued on Page 217)

Eastern Fields

(Continued from Page 190)

Hash farm in McComas district; R. H. Adkins on the Otto Browning farm, and Harry Hatfield Co. on the Leslie Hatfield farm; in Calhoun County, by Paul E. and O. E. Garrett on the Lake Fogel and Floyd Wilson farm in Sherman district.

In Gilmer County locations were made by K. F. Ermlich on the A. E. Goff heirs' farm; in Hancock County, by R. J. Braden Co. for No. 62 C. E. Brenneman; in Marshall County, by Hazlett Brothers and Conley on the Lydia McMechen estate in Union district; in Pleasants County, by L. C. White and others on the State Farm, Union district; in Grant district, by Reno Oil Co. for No. 3 G. B. Rosson; in Gilmer County, by Pittsburgh & West Virginia Gas Co. for No. 1 H. L. Simmons, Glenville district. In the same district, W. H. Petry is drilling at 450 feet in the T. A. Reed test, and made a location for No. 1 Gilmer County Court House. E. L. Bush has material on the ground for No. 1 Guy B. Young and others. Oran R. Bush made a location for No. 2 Anna Belle King.

In Doddridge County, Henderson Oil Co. is drilling at 1,960 feet in No. 1 Alex Liggett; W. H. Ahner at 900 feet in No. 1 N. J. Cunningham; Broadwaters and Wilson at 1,960 feet on the W. F. Squires farm.

In Lincoln County, A. F. Black is down 2,225 feet in the D. E. Wilkerson test, in Carroll district. In Harts Creek district, Sand Creek Gas Co. is down 1,300 feet in No. 5 Phillip Hager. Phillip Hager made a location on the Watson Adkins farm, and the Sand Creek Oil Co. made one on the J. L. Caldwell farm. In Sheridan district, Templeton Gas Co. is down 1,450 feet in No. 2 J. T. Morrison heirs. In Union district, the Blue Ridge Gas Co. is down 2,640 feet in No. 52 Walter Scaggs.

In Mingo County, United Fuel Gas Co. has a road to a location on the Nighbert Land Co. in Kermit district. In Putnam County, V. C. Smith and others are down 1,325 feet on the East End Land Co. land, in Teays Valley district. In Scott district, H. H. Pine has locations for Nos. 1 and 2 on the P. S. Eggleton farm. The Smith Oil & Gas Co. made locations for tests on the Grace M. Taylor farm and the A. B. Griffith farm.

In Roane County, the Hope Natural Gas Co. is down 2,503 feet in No. 7804 H. D. Howell, Curtis district. In the Watson district, Virginian Gasoline & Oil Corp. made a location on the E. C. Dillard and others land. In Harper district, L. L. Reed and others have a location on the F. W. Westfall farm. O. H. Reed and others have locations for Nos. 1 and 2 P. V. Litton.

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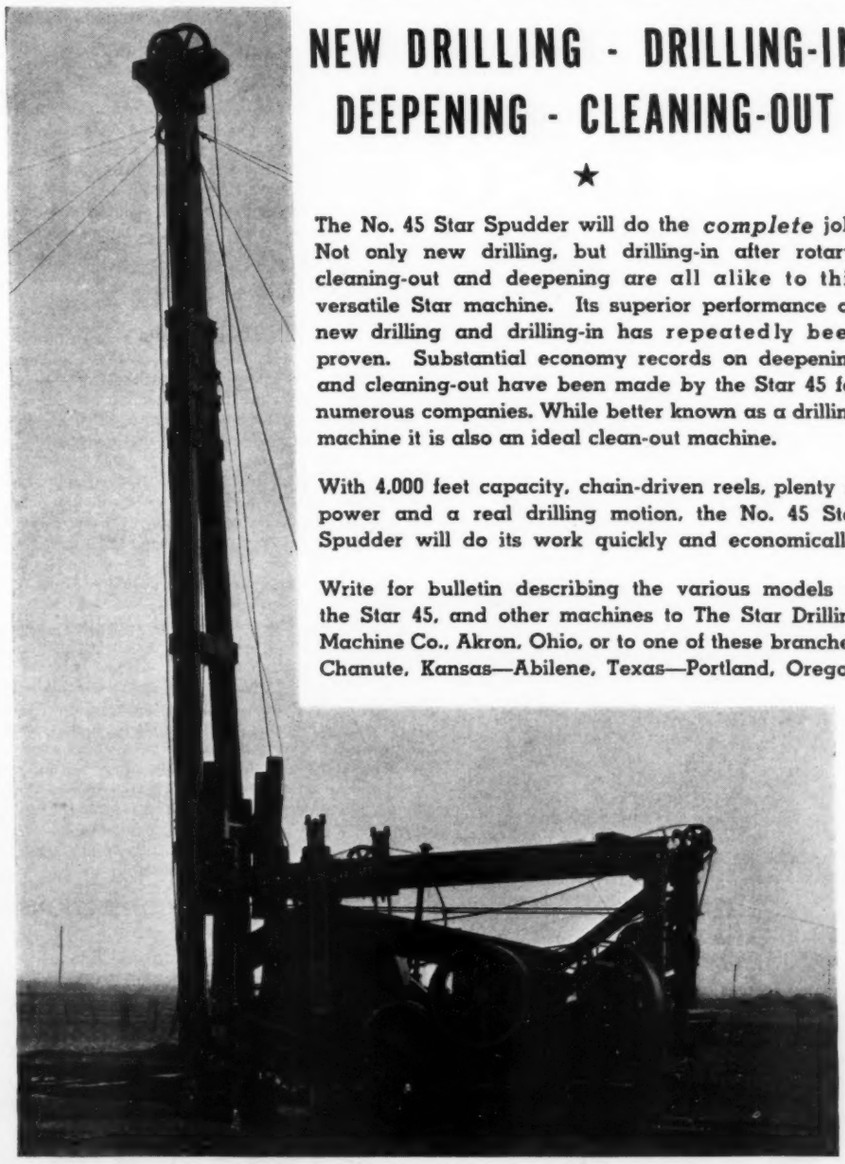

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STAR DRILLING MACHINES

North and East Texas

By MITCHELL TUCKER

More New Capital Invested in Wichita and Archer Area

WICHITA FALLS, Mar. 28.—With about the usual amount of interest shown to wildcat extension activity in the K.M.A. pool of Wichita and Archer counties over the past week, the center of attention was drawn to several large lease deals in the pool proper and in the vicinity of the new Archer County discovery.

Helmerich & Payne, Inc., of Tulsa, and Blackwell Oil & Gas Co. of Cushing, Okla., purchased from Hull & Silk, their half interest in the new Archer County discovery for a reported consideration of $850,000. The terms of the sale were $150,000 cash, $350,000 in notes, and an additional $350,000 out of oil. Included in the purchase were the full ownership of the newly discovered well and a seven-eighths interest in an adjoining 160-acre tract. However, Hull & Silk retained several tracts of acreage on one side of the well, which is the No. 1 Wilson, in Block 25, A.T.N.C.L Survey, about 3 miles southeast of Holliday and 6 miles southeast of the K.M.A. pool.

Another large transaction, but in the K.M.A. pool proper, was the purchase by Staley Oil Co., A. C. Huckleberry, W. D. Cline and C. H. Staley of 400 acres out of the Mangold subdivision on the western side of the pool for a reported consideration of $550,000. Terms of the sale were $50,000 in cash and $500,000 in oil payments. The leases purchased are in the P. Castleman Survey and include Block 32 in Wichita County and Blocks 30 and 31 just below the Wichita County line and in Archer County.

The Hull-Silk and Helmerich & Payne No. 1 Wilson, discovery in Archer County, which created a rush for acreage in all directions following the strike, picked up a new sand at 3,825 feet and cored 40 feet of pure formation. Estimates from its performance give the well a potential anywhere from 4,000 to 5,000 bbls. daily, and on a 30-minute test the well flowed 96 bbls. through ¾-inch choke.

An increase in activity was shown in the past week on the east side of the pool when two tests gave indications of becoming producers. Two miles east of the Clyde-Texan No. 1 A. Burnside producer, the Flanagan-Modesett Co. No. 1 Texas Mortgage, in Block 1, Palo Pinto school lands, J. McCool Survey, found a saturated sandy lime at 4,051-70 feet and is setting pipe to test. Peery & Woody have taken over the old E. J. Stump No. 1 Mary Bishop, previously listed as dry, and are reconditioning the hole in an attempt to make a commercial producer of it. Successful completion of either the Stump or Flanagan-Modesett tests will add a huge scope to the acreage already proven on the east side of the field.

On the west side of the field, Monty Staniforth No. 1 Waggoner, in section 35, Block 7, H.&T.C. Survey, looms as a 1-mile extension. With 2,000 feet of oil in the hole after it was acidized in an upper lime, spudder is being rigged up to drill plug from casing cemented at 3,904 feet, total depth. Located 2½ miles northeast of the Bolin-Whittington extensioner on the west side, the completion of this well would add considerable territory to the future-development list.

After topping the Ellenburger lime at 4,222 feet, and penetrating it to 4,233 feet, with no encouraging showing, the Continental Oil Co. will plug back No. 1 Waggoner Bros., and shoot a saturated lime from 3,820-3,990 feet in an effort to make a producing well. The wildcat is in section 11, B.S.&F. Survey, Lot 2, and is a northeast offset to Melat & Graham No. 1 Waggoner, a producer, in the Eaves Survey.

Three miles north and west of the Joe Worsham producer, the Merrick-Target No. 1 Waggoner, in northeast quarter of section 35, Block 5, H.&T.C. Survey, failed to respond after a shot at 3,625-55 feet. Now bottomed at 3,794 feet, the test is cleaning out and may be drilled deeper.

Clark & Cowden No. 1 W. T. Waggoner, located in the A. Gibson Survey, Abstract 455, farthest northwest drilling well in the field which gave earlier indications of becoming a producer, is now cleaning out to bottom with no showing of oil or gas after a shot.

Clay County

The Edrington pool of Clay County, 2 miles south of Thornberry and about 7 miles northeast of Henrietta, is undergoing one of the most extensive shallow drilling campaigns that the area has experienced in several years. Discovery of the field's producing horizon came when the Bridwell Oil Co. brought in its No. 1 Edrington from a sand at 1,088-1,106 feet, flowing 153 bbls. At present there are 23 producing wells in the field with productions ranging from 50 to 300 bbls. per day. There are six tests drilling.

EASTERN TEXAS FIELDS

DALLAS, Tex., Mar. 28.—The Flag Lake pool of northwestern Henderson County continues to center much attention in the East Texas district as further exploration of the newly revived area progresses. Ed DeArman, one of the discoverers of the field, has staked location for No. 1 L. L. Persons, on a 104-acre tract in the G. Hancock Survey No. 7, about a mile west of production. The Texas Co. No. 1 Jarrell, south offset to Hunt and others No. 2 Dowdy, in the same survey, is the only drilling well in the pool proper. It is now drilling below 1,700 feet.

Deep Tests

The Stanolind Oil & Gas Co. No. 1 Tenny Norris, in the K. Thrasher Survey of Limestone County, has found no favorable showing from higher horizons. Originally drilled to 9,951½ feet, with no production possibilities found, operators are now testing the upper strata while plugging back. In Gregg County, Humble Oil & Refining Co. and Gulf Oil Corp. No. 1 E. Robertson, in the M. Mann Survey, 2½ miles southwest of Longview, is drilling ahead below 9,280 feet in hard sand with streaks of shale. Tom Hunter and American Liberty Oil Co. No. 1 Carter, in the Fields Survey on the Kelsey dome in Upshur County, has resumed operations and will be carried sufficiently deep to test the Lower Marine series. The test has been shut down for several weeks at 7,933 feet.

A deep wildcat oil test about midway between Fort Worth and Dallas, near Grand Prairie, is planned in the immediate future by Mark Raley of Fort Worth, who has assembled a 9,000-acre block in this vicinity. Contract has already been let to a depth of 5,000 feet.

Humble Oil & Refining Co. has staked an important wildcat location in the extreme north central portion of Smith County, just south of the Sabine River, on the J. C. Crone tract, William Middleton Survey. If the Woodbine sand markers are favorable, the well may be carried as a deep Lower Trinity test.

EAST TEXAS FIELD COMPLETIONS

(One-hour gauges)

Gregg County—Kilgore Area

Gulf Oil Corp. No. 25 R. H. Still, 3,502-56 feet, 60 bbls. Humble Oil & Refining Co. No. 95-B S. S. Laird, 3,527-77 feet, 55 bbls. M. W. McVey No. 4 Laird, 3,523-39 feet, 30 bbls. Riley Oil & Royalty Co. No. 9 Mitchell, 3,580-3,600 feet, 60 bbls. H. R. Smith No. 2 Sanders, 3,546-60 feet, 60 bbls. Sun Oil Co. No. 38 Hilburn-Lloyd, 3,679-80 feet, 16 bbls. Tide Water No. 37 M. B. Hughey, 3,489-3,512 feet, 48 bbls.

Gregg County—Longview Area

Amereda Petroleum Co. No. 17 W. E. Bumpas, 3,555-85 feet, 50 bbls. L. Carr No. 3 Richey, 3,531-3,664 feet, 58 bbls.; No. 4 Richey, 3,550-65 feet, 30 bbls. Gulf Oil Corp. No. 11 A. Neely, 3,503-31 feet, 45 bbls. Jackson-Wise & Sneeden Uo. 9 Corbin, 3,520-3,614 feet, 120 bbls. Magnolia Petroleum Co. No. 22 Ziegler, 3,470-99 feet, 80 bbls. Margay Oil Co. No. 11 R. Corbin, 3,553-54 feet, 64 bbls. Shell Petroleum Corp. No. 9 Bassham, 3,576-3,705 feet, 50 bbls.; No. 10 Bassham, 3,583-3,651 feet, 54 bbls. Sinclair Prairie No. 17 I. Isley, 3,570-3,705 feet, 70 bbls. Stanolind & Tide Water No. 16 J. W. Aikens, 3,509-93 feet, 35 bbls. Sun Oil Co. No. 10-A A. Tooke, 3,564-3,618 feet, 32 bbls. Superior Oil Co. No. 27 Ingram, 3,560-3,603 feet, 120 bbls.

Rusk County—Joiner Area

Adams & Despot No. 5 Dr. Deason, 3,658-3,710 feet, 35 bbls. Ambassador Oil Co. No. 5 Hamilton, 3,747-60 feet, 60 bbls. Atlantic No. 17-A Pinkston, 3,652-3,720 feet, 38 bbls. Chicago Oil Co. No. 5 Alford, 3,635-54 feet, 20 bbls.; No. 7-B Alford, 3,580-94 feet, 40 bbls. F. W. Fisher No. 7 Eaton Consolidated, 3,751-61 feet, 50 bbls. Gulf Oil Corp. No. 11 H. Johnson, 3,791-95 feet, 60 bbls. J. K. Hughes No. 4 Wilson, 3,596-3,602 feet, 85 bbls. Humble Oil & Refining Co. No. 12 Wilson, 3,594-3,644 feet, 60 bbls. Magnolia Petroleum Co. No. 7 Holland, 3,666-3,735 feet, 40 bbls. Ohio Oil Co. No. 13 Lunsford, 3,637-89 feet, 40 bbls. Shell Petroleum Corp. No. 23-B H. Brooks, 3,639-3,749 feet, 30 bbls. Stanolind Oil & Gas Co. No. 32-A H. C. Maxwell, 3,748-94 feet, 48 bbls. Ward Oil Co. No. 42 E. S. Thrash, 3,752-96 feet, 48 bbls.

Rusk County—Kilgore Area

Stanolind-Crosby No. 7 M. R. Terrell, 3,713-14 feet, 40 bbls.

Upshur County—Longview Area

Ellis Oil Co. No. 6 Mackey, abandoned location; No. 15 Mackey, abandoned location. Humble Oil & Refining Co. No. 14 E. Edwards, 3,605-3,683 feet, 50 bbls.; No. 24 H. W. Johnson, 3,674-79 feet, 43 bbls. P. H. Pewitt No. 8 J. C. Porter, 3,730-31 feet, 26 bbls. Shano Oil Co. No. 12 B. Doby, 3,770-71 feet, 33 bbls.; No. 13 B. Doby, 3,734-35 feet, 24 bbls. Sun Oil Co. No. 4 Crosby-Williams, 3,652-53 feet, 60 bbls.

EAST CENTRAL TEXAS COMPLETIONS

Anderson County

In the Long Lake field, A. E. Burgin No. 1 Bigler, abandoned location. Hunt Production Co. No. 1 J. Brantley, 3,513-14 feet, 65,000,000 feet of gas.

Angelina County

Ginter Co. No. 3 Copes Heirs, 2,186-2,200 feet, 10 bbls. per day.

Henderson County

S. B. Howard No. 1 Self, dry and abandoned at total depth of 5,007 feet.

Titus County

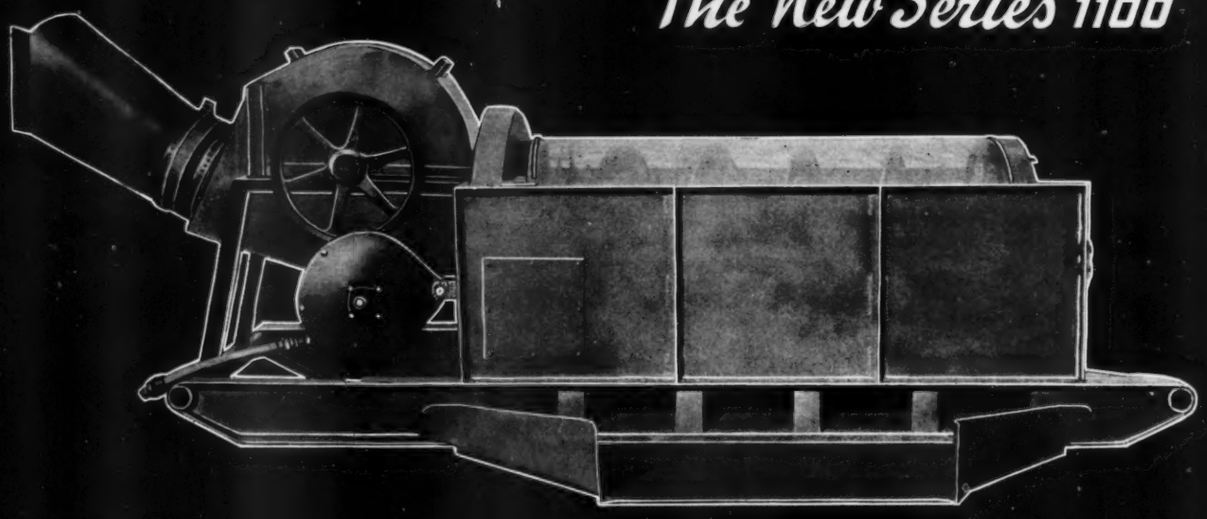
In the Talco field, C. O. Byrd No. 1 Wilson, 4,223-69 feet, 375 bbls. per day.

Will Start Test in Georgetown County, South Carolina

CHARLESTON, S. C., Mar. 28—The first test for oil ever to be made in the coastal region of South Carolina is expected to get under way within the next 30 days when the South State Oil Co. starts exploration on a block of leases in Georgetown and Williamsburg counties. A standard rig complete with tools was being unloaded today at Hemingway, county seat of Williamsburg County. The drilling equipment was shipped from Muskogee, Okla.

Location has been made in Georgetown County just over the Williamsburg County line. P. O. Wall, of Plantersville, S. C., treasurer of the South State Oil Co., is authority for the statement that the first well will be drilled on the Lee Williams tract in the western part of Georgetown County.

The New Series 1100



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Michigan Field Report

By
O. C. PRESSPRICH

Edenville's Second Well Is Good for 1,200 Barrels Daily

SAGINAW, Mich., Mar. 28.—Progress toward confirmation of the Edenville oil strike in Midland County overshadowed all other developments of the week, holding forth promise of rivaling the famous Porter and Buckeye fields, even on the basis of its present two-well status.

The second well in the new Edenville area, west offset of Chapman Oil Co.'s January 31 discovery, proved better than the discovery test. It was Mammoth Producing & Refining Corp. No. 1 Ricket, NE SE NW section 27-16n-1w, a steadily flowing natural producer estimated at 1,200 bbls. daily, but pinched in to about 40 bbls. hourly due to limited storage facilities. The well came in March 23 after passing through 10 feet of pay streak in the Dundee limestone, to bottom at 3,810 feet. It was deepened 2 feet Thursday to 3,812 feet, where it has maintained a steady output under curb. Gas pressure was stronger than in the discovery hole.

Nearly impassable roads into the location prevent moving of equipment and storage tanks to the site as well as to other parts of the Edenville region, where a certain boom in exploration impatiently awaits spring and settled highway conditions.

The Mammoth corporation holds extensive acreage in the Edenville area, and plans moved forward to rush drilling on all property accessible by roads. Mammoth No. 1 Higgins, SW NW NE section 27, north offset to the Chapman discovery, was drilling at about 3,000 feet at the week-end and was expected to tap the Dundee pay this week. The No. 2 Higgins, NW NW NE section 27, was at 1,200 feet. Meanwhile Smith Petroleum Co. No. 1 Snyder, SW SW SE section 22, three locations north of Chapman's well, was scheduled, barring accidents, to be the next well in the new field to hit pay. It was reported below 3,400 feet Friday, and was expected to top the Dundee in a few days. It was looked on by operators as a guide to development of the area northward. Production there would be of greater significance than the Mammoth Rickets good showing.

Progress was reported at several other tests drilling toward the Dundee in all directions from the discovery well. Sun Oil Co. No. 1-A State-Jerome, N half NW NW section 3, Jerome Township (15n-1w), was drilling below 2,800 feet in a test to sample the oil possibilities of that area. Another test outside the borders of Edenville Township proper was Wicklund Development Co. No. 3 Land & Royalty, NE NW SE section 24, Warren Township (16n-2w), 4 miles west of the Chapman discovery, which was shut down at 3,964 feet last week after picking up water. The hole is to be reduced, straightreamed, and a casing run to shut off water as drilling proceeds further into the Dundee, which was found at 3,816 feet. Gordon Oil Co. No. 1 Verity, NW SW NW section 26-16n-1w, half a mile east of the discovery, was reaming below 1,000 feet with 8-inch casing to be run between 1,100 and 1,200 feet. Cave-ins made setting of pipe at 772 feet unsatisfactory. M. L. Jorgensen No. 1 Gamble, NW NE SW section 26-16n-1w, more than a mile east of the Gordon-Verity test, was below 1,700 feet Friday. Several other tests surrounding the discovery well were at various stages between 150 and 600 feet.

Gladwin County—Buckeye Township

After two weeks of lagging development in Buckeye oil fields, north and south Buckeye climbed back into new production columns last week with six producers, two in the semicompleted state. Outstanding among the new oil wells is T. F. Caldwell No. 1 Hostetler, SE SE NE section 27-18n-1w, a 230-bbl. well after acid treatment. To the industry this wildcat test—a western edge venture of the midway field when started—is just another well extending the field, but behind the scenes lies a hard luck story which set records for Michigan oil drilling. The test was spudded in June 7, 1937, far off the beaten path of drilling in section 27, more than a mile west of production. Today, as a completed well, it has producers to the north and east, but it still holds the distinction of being the western outpost of the south (Oard) pool. For more than a month after spudding in the test proceeded smoothly, then the jinx appeared. On July 29 the rig was destroyed by fire, and while fighting the fire a tool dresser fell through the roof of the derrick house, fracturing eight ribs. The fire followed by two days the breaking of a stem, which dropped the tools into the 3,160-foot hole. On August 4 operators started repair work on the rig, and 20 days later fishing for lost tools was started. After unsuccessful efforts at fishing an attempt was made to drill around the lost tools, which resulted in more difficulty and more lost tools. After 127 days, fishing was abandoned, and on February 9, 1938, seven months after the hole was spudded in, another hole was started, with the rig skidded. Deducting 2½ days for a temporary shutdown, a 25½-day record of drilling was established when the well went into the Dundee. This was a new record for speedy drilling in Buckeye. Drilling continued to 3,596 feet where first pay was encountered, and at 3,604 feet, total depth, it was acidized. The well had come in at 50 bbls. per day natural flow, but increased to 230 bbls. by the acid treatment.

Two section 26 tests completed the south (Oard) pool development of the week. M. L. Jorgensen No. 3 Foster, NW NE NW section 26-18n-1w, developed 300 bbls. daily production after acid, and Rex Oil & Gas Co. No. 2 Foster, NE SW SE section 26-18n-1w, was a 50-bbl. natural producer, scheduled for acid treatment. In the north (Wicklund) pool one well was added to production. It was Sun Oil Co. No. 1 Hipfel, SE SW SW section 2-18n-1w, a northeast development, rated at 50 bbls. daily after acid.

Gladwin County

A small commercial producer and a dry hole were added to Hay Township's oil field last week. J. V. Wicklund Development Co. No. 4 State Bank, NW SE SW section 16-18n-1e, rated as a 70-bbl. daily producer after acid, while L. & S. Co. No. 1 Flory Estate, NW NW SE section 21-18n-1e, found the Dundee dry and will be abandoned.

Bentley Township had a 50 per cent average for the week with one producer, and one dry hole. J. V. Wicklund Development Co. No. 4 Wright, NW NE NE section 28-17n-2e, was a 40-bbl. daily producer after acid, and Fortney Oil Co. No. 1 Trine, NW SW NW section 16-17n-2e, was dry.

Isabella County—Sherman Township

Pure Oil Co. No. 2 Fred Beutler, SW NW NE section 33-15n-6w, gauged 150 bbls. naturally, and was listed for acid treatment. It was the only recent producer developed in Sherman Township.

Isabella County—Nottawa Township

J. V. Wicklund Development Co. No. 4 Lawens, NW SW SE section 24-15n-5w, was tapping the Dundee limestone late last week in the hope of connecting with the oil show evident at Boston Oil & Gas Co. No. 1 Fox test, 1 mile to the northwest. The Fox test, which had indications of opening a Nottawa pool, was ruined by cave-ins and other trouble.

Montcalm County—Pine Township

What is believed to be the opening of a new Traverse oil pool in Montcalm County was credited to H. L. Gentry Engineering Co. No. 1 Christensen, SE NW NE section 29-11n-8w, which flowed 120 bbls. naturally about 80 feet in the Traverse formation at a depth of 2,837 feet. This wildcat is 7 miles southeast of the lone producer in Winfield Township (12n-9w), of Montcalm County, where little exploration has been carried on. Packer trouble interfered with the flow, but operators were hopeful of repairing the trouble speedily. Montcalm County has one Traverse field in Home Township (12n-6w), where nine wells are producing. Operators agreed that the Gentry-Christensen test might be the discovery well of a new Traverse pool in the area. Oil was encountered soon after penetration of the pay zone, with the test flowing in two heads.

Kalamazoo County

Two Premier Oil Co. wildcats in Oshtemo Township, Kalamazoo County, were testing possibilities of pay stratum late in the week, with one apparently headed for failure. No. 1 Bourner, SW SW SW section 2-2s-12w, logged a small show in the Traverse limestone, and the test was being deepened in search of a better show before acid was used. The test is down 1,450 feet. No. 1 Stevens, SE SE SW section 21-2s-12w, is shut down below 1,550 feet, with Dundee water present. Operators are debating the advisability of abandonment.

Clare County

Disaster struck at Gulf Refining Co. No. 1 Doherty, SW SW SW section 25-17n-4w, Grant Township, Clare County, deep oil test drilling adjacent to Gulf's recent 14,000,000-foot gasser, when the rig collapsed narrowly averting injury to eight men. The rig fell as drillers were pulling rotary drill pipe from the hole. Seven men jumped to safety. One threw himself under a bench and was uninjured. The hole had penetrated the Michigan Stray gas sand, where the heavy Gulf gasser came in recently. Drillers rebuilt the rig last week, and were preparing to continue drilling for oil with standard cable tools. The Doherty is a north offset to the Gulf gasser. Considerable gas interest is evident in the vicinity, with several locations staked, and one test, James A. McKay No. 1 Joslin, NW NW NW section 35-17n-4w, ready to spud in for a gas test.

N. Y.-Penn. Gas Fields

COUDERSPORT, Pa., Mar. 28.—Two locations were added to the list of operations in the New York-Pennsylvania Oriskany sand fields during the past week, both in Pennsylvania, and both by the New York State Natural Gas Co. which is pursuing a vigorous exploration campaign of these fields. These two locations bring its total of operations to seven.

One of the locations was staked on the J. D. Morley farm, Bingham Township, Potter County, and the other on the L. Dickinson farm, Gaines Township, Tioga County.

Pennsylvania Operations

Addition of the two locations brought the number of north Pennsylvania operations up to 10, only one of which is actively drilling. New York State Natural Gas Co. added 500 feet to its test on the W. A. Simmons farm in Brookfield Township, Tioga County, and is now at 2,270 feet.

In Potter County, New Penn Development Corp. is rigging up a rotary on the Haupt farm test, down 5,700 feet, in West Branch Township; French and others, shut down at 4,900 feet on the H. O. Perry farm, Genesee Township; Williamsport Oil & Gas Co., an idle location on the U. B. Russell farm, Sharon Township; New Penn Development Corp., moving in on the James Hill farm, West Branch Township, and Hanley & Bird, moving

(Continued on Page 212)

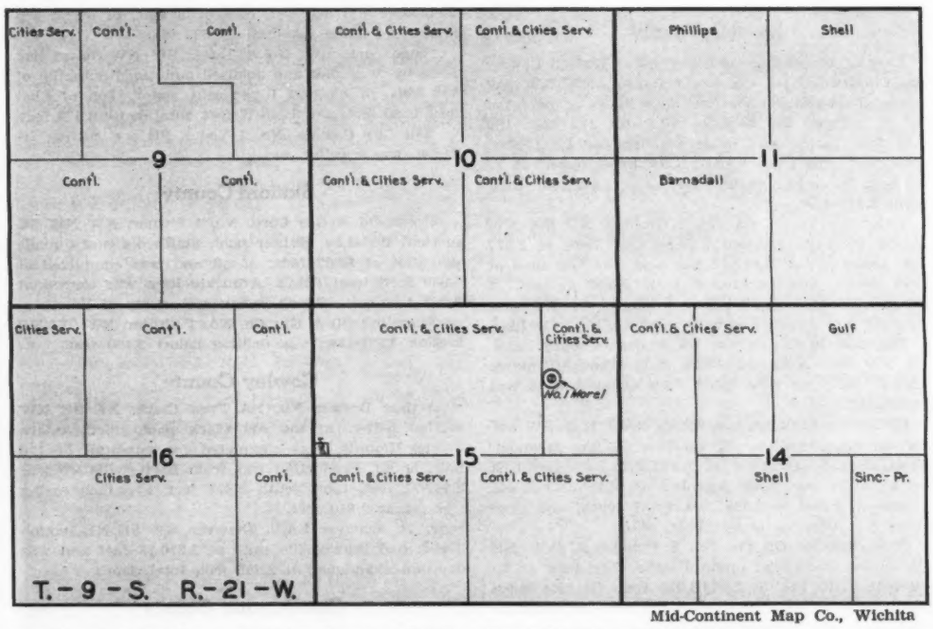
Kansas Developments

By
DAL DALRYMPLE

Graham County Wildcat Has Saturation in Arbuckle Lime

Graham County claimed attention of western Kansas operators the past week when a wildcat gave promise of opening the county's first oil pool. Continental Oil Co. and Cities Service Oil Co. No. 1 Morel, C W half E half NE section 15-9-21w, southeastern Graham County, found Arbuckle lime at 3,711 feet and recovered 18 inches of oil saturated core at 3,715-19 feet, total depth. Seven-inch casing was set at 3,712 feet. Operators had rigged up standard tools and were to bail and drill plug preparatory to testing.

Nearest production to the Graham County outpost is in the Zurich pool to the southeast in Rooks County and the Wakeeney pool to the southwest in Trego County, each about 16 miles distant. Location is in a region between the Otis arch and Norton granite ridge. If the wildcat is completed as a producer it will encourage further exploration in northern Kansas, particularly in Graham, Rooks, Norton, Trego and Phillips counties.



Mid-Continent Map Co., Wichita

Continental Oil Co. and Cities Service Oil Co. No. 1 Morel, section 15-9-21w, gave promise of opening Graham County's first oil pool

Opening of a new producing area in Ellis County appeared imminent at Carter Oil Co. No. 1 Foster, SE SE NW section 1-15-16w, wildcat in the southeastern part of the county. It had a showing of oil in Arbuckle lime at 3,447 feet, operators set casing and were preparing to test. Top of lime was 3,440 feet. Nearest production is in the Donovan pool, 5 miles southeast in Russell County.

A Russell County wildcat, C. L. Parks and others No. 1 Gorham, SW SW NW section 19-15-15w, about 4 miles southeast of the Ellis County outpost, also gave promise of being a producer. It had a showing of oil in Lansing lime at 3,115 feet, total depth. Operators were running casing and were to drill into the formation and test.

The Graber pool in southeastern McPherson County was extended one-fourth mile east at Continental Oil Co. No. 3 Boeckner, SW SW NW section 28-21-1w. Oil rose 900 feet in the hole when it was deepened to 3,349 feet after plug had been drilled in 7-inch casing set at 3,332 feet. Top of Hunton lime was 3,331 feet. It was to be acidized before completing. Three offsets will be required.

Fate of Continental Oil Co. and others No. 1 Fair, CNL SW section 12-25-13w, wildcat 3 miles southeast of the St. John pool in Stafford County, may be determined this week. It topped Arbuckle lime at 4,153 feet and cores to 4,163½ feet carried spotted saturation. Seven-inch casing was set on top of the lime preparatory to testing.

Another Russell County wildcat was showing as a pool opener at Jones & Shelbourne and others No. 1 Kuhnle, SE SE NW section 4-15-12w, about 10 miles southeast of the county seat. It found Lansing-Kansas City lime at 2,955 feet, had pay at 3,040-45 feet and oil rose 2,300 feet in three hours. Casing was set and operators were rigging up standard tools. Nearest production is in the Letsch pool, 5 miles northwest.

Allowable production in Kansas for April was set at 173,000 bbls. daily by the corporation commission, the amount being the market demand estimate of the Bureau of Mines. The March allowable was 169,528 bbls. daily.

Wildcat Operations

Wildcat completions in Kansas were scarce the past week, only two tests being carried to decisions. In addition, four rigs and locations for wildcats were abandoned.

Sooby and others No. 1 Davis, SW NE NW section 29-33-10, was completed as a small producer to open a producing area northwest of Lowe in Chautauqua County. It had Peru sand at 1,524-48 feet, total depth, was shot and pumped 4 bbls. of oil and 1 bbl. of water daily.

Landon & Mendenhall No. 1 Slough, NE NE SW section 9-24-13, wildcat in Greenwood County, had a hole full of water in Arbuckle lime at 1,973-80 feet, total depth, and was abandoned.

The wildcat locations abandoned were: Clyde Pulse and others No. 1 Boesker, SE SE NW section 29-20-1w, McPherson County; Carlock No. 1 Kinzel estate, SW SW SW section 9-13-22w, Trego County; Witt & Sheridan and others No. 1 Morrison, NW SE SW section 29-10-17w, Rooks County, and S. L. Milton No. 1 Hunt, SW SW NE section 16-34-5. Operations may be resumed later at any of these locations.

Showings of oil and gas of more or less significance were recorded at several wildcats.

Jones & Shelbourne and others No. 1 Kuhnle, SE NW section 3-15-12w, southeastern Russell County, found Kansas City lime at 2,954 feet and had a showing of oil at 2,967-75 feet. Eight-inch casing was being underreamed.

Simpson & Lampi and Atlantic Refining Co. No. 1 Bexberger, NE SE NW section 10-15-14w, Russell County, had showings of oil at 2,830-50 feet, 2,930 feet, gauged one-half barrel of oil an hour at 2,984-86 feet and was drilling ahead.

National Refining Co. No. 1 Bonham, SW SE section 28-25-12w, wildcat in southern Stafford County, had a slight showing of oil in Simpson sand at 4,152-59 feet, in Arbuckle lime at 4,200-05 feet, and was underreaming.

Carter Oil Co. and L. H. Wentz No. 1 Ely, C NE NW section 6-32-14w, western Barber County outpost, had a smell of gas on drill stem test at 4,729-46 feet, a slight stain of oil in Simpson sand core at 4,845-56 feet, and was drilling ahead.

Estimated Daily Production

Estimated daily production for Kansas for the week ending March 26, and for the preceding week, was as follows:

	Barrels	
	Mar. 26	Mar. 19
Oxford City	2,000	2,000
Burrton	11,525	11,475
Ritz-Canton	6,475	6,500
Graber	2,900	2,450
Hollow-Nikkel	3,850	3,750
Lerado	1,125	975
Voshell	3,100	3,050
Wellington	2,350	2,300
Ellsworth County:		
Lorraine	2,825	2,790
Other pools	1,285	1,500
Rice-Barton counties:		
Bloomer	2,975	2,775
Chase	6,125	5,130
Geneseo	2,075	1,990
Raymond	1,125	830
Silica	15,500	14,870
Silica—South	3,100	2,475
Keesling	850	900
Wherry	4,675	4,750
Miscellaneous Rice	3,635	3,860
Miscellaneous Barton	5,825	4,480
Russell County:		
Fairport	1,935	1,815
Gorham	2,005	1,720
Russell	1,175	1,580
Sullivan	8,490	8,065
Trapp	9,815	8,320
Miscellaneous Russell	7,030	7,660
Sedgwick County:		
Valley Center	1,030	1,060
Miscellaneous	2,920	2,860
Ellis County:		
Bemis	6,425	5,665
Miscellaneous	2,640	2,835
Kingman County	570	648
Stafford County	2,270	2,535
Greenwood County	9,500	9,400
Butler County	16,100	16,000
Other fields	26,525	23,037
Total Kansas	178,750	172,050

Barton County

Magnolia Petroleum Co. No. 5 Roetzel, NW SW NE section 25-20-11w, Silica South area, Barton County, was completed at 3,277 feet, total depth, making potential of 1,668 bbls. of oil after treating with 2,000 gallons of acid. Production was from Arbuckle lime topped at 3,265 feet. Seven-inch casing was set at 3,266 feet.

Simpson & Noble and others No. 1 Dick, NE NW NW section 3-20-11w, found Arbuckle lime at 3,306 feet, was bottomed at 3,320 feet, was acidized four

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times with a total of 3,500 gallons, and made potential of 258 bbls. of oil.

Shell Petroleum Corp. No. 4 Schneider-B, SE NE NW section 1-16-14w, Trapp district, was bottomed at 3,305 feet, pumped 210 bbls. of oil in the first four hours, 194 bbls. in the next four hours and made potential of 1,166 bbls. of oil, with 12 bbls. of water. Top of Arbuckle lime was 3,278 feet.

Polk & Fortson No. 1 Kultgen, NE NE SW section 16-16-12w, topped La Motte sand at 3,380 feet, the hole filled with water at 3,384-85 feet, total depth, and operators plugged back to 3,353 feet, shot and acidized without results, and it was abandoned.

Aylward Production Co. No. 2 Wissman, C W half W half NW section 31-18-15w, Albert area, found Arbuckle lime at 3,572 feet, La Motte sand 3,576 feet, total depth 3,378 feet. It pumped 193 bbls. of oil in the first four hours, 160 bbls. the next four hours and had potential rating of 958 bbls.

Skelly Oil Co. No. 1 Grosshardt, NE cor. section 15-17-11w, Kraft pool, found Arbuckle lime at 3,327 feet, total depth 3,329 feet, and was acidized with 1,500 gallons. It pumped 80 bbls. of oil and 44 bbls. of water the first four hours, 26 bbls. of oil and 40 bbls. of water the next four hours, and had potential rating of 156 bbls. of oil.

Transwestern Oil Co. No. 2 fee, SE cor. section 12-17-11w, topped Kansas City lime at 3,010 feet, had pay at 3,100-06 feet and was bottomed at 3,231 feet. After shooting and acidizing with 2,000 gallons, it pumped 160 bbls. of oil in first four hours, 174 bbls. the next four hours and made potential of 960 bbls.

Larlo Oil & Gas Co. was reported to have staked location for a wildcat on Gulf Oil Corp. farm-out at No. 1 Hulme, NE cor. section 21-20-12w, on a trend between the Ellinwood area of Barton County and the Gates pool in Stafford County.

Russell County

Largest completion of the week in Russell County was Continental Oil Co. No. 1 Rein-A, NW NW SW section 27-14-13w. In the first four hours of potential test it pumped 369 bbls. of oil, with 312 bbls. the next four hours, and made potential of 1,812 bbls. production was from Kansas City lime topped at 2,860 feet. Seven-inch casing was set at 2,882 feet, total depth 2,912 feet.

Cities Service Oil Co. No. 1 Graham, SW SW NW section 28-14-13w, topped Kansas City lime at 2,877 feet, found pay at 2,912-22 feet and was bottomed at 2,926 feet. After acidizing with 5,000 gallons, it pumped 266 bbls. of oil the first four hours, 253 bbls. the next four hours, and made potential of 1,518 bbls.

Magnolia Petroleum Co. No. 1 Brandenburg heirs, NW NW SW section 20-14-14w, had Arbuckle lime at 3,282-83 feet, the hole filled with water and it was abandoned.

Helmerich & Payne and others No. 1 Hall, SW SW NW section 22-14-14w, on an Ohio Oil Co. farm-out, found Kansas City lime at 3,039 feet, was acidized and at 3,078 feet made potential of 654 bbls. of oil. It was deepened to 3,084 feet, total depth, and completed for potential of 981 bbls. of oil.

Cities Service Oil Co. No. 8 Strecker-A, NW NE NE section 35-14-14w, found Kansas City lime at 2,916 feet, with pay at 2,948-3,015 feet. Granite wash was topped at 3,164 feet, the hole was bottomed at 3,318 feet and plugged back to 3,015 feet. It was treated with 10,000 gallons of acid, pumped 226 bbls. of oil and 2 per cent water the first four hours, 206 bbls. of oil and 4 per cent water the next four hours and was completed for potential of 1,239 bbls. of oil, cutting 4 per cent water.

B. B. & M. Petroleum Co. and others No. 1-A Gaynor, SE SE NW section 19-13-14w, topped Kansas City lime at 2,914 feet, total depth 2,978 feet and plugged back to 2,930 feet. It was acidized with 8,000 gallons and made potential of 863 bbls. of oil from pay at 2,914-15 feet and 2,926-30 feet.

Ellis County

Sinclair Prairie Oil Co. No. 4 Cress, SW SE NE section 13-11-17w, Cress pool, Ellis County, was bottomed at 3,355 feet, swabbed 28 bbls. of oil an hour after a head and, after treating with 2,000 gallons of acid, made potential of 1,050 bbls. of oil. Production was from Arbuckle lime topped at 3,353 feet.

Cities Service Oil Co. No. 8 Hall-B, NW NW SW section 26-11-17w, Bemis district, found Arbuckle lime at 3,412 feet, had pay at 3,416-25 feet and was bottomed at 3,438 feet. It was acidized with 1,000 gallons and pumped 119 bbls. of oil in four hours; reacidized with 2,000 gallons and made potential of 2,359 bbls. of oil.

York State Oil Co. No. 3 Bemis, NE NW SW section 28-11-17w, was treated with 1,000 gallons of acid, pumped 40 bbls. of oil an hour and made potential of 1,182 bbls. Top of Arbuckle lime was 3,439 feet, total depth 3,459 feet.

Vickers Petroleum Co. was moving in material at No. 1 Martin Ubert, SW SW SE section 1-13-18w, northeast offset to the discovery well in the Ubert pool.

Rice County

Continental Oil Co. and associates No. 1 Warner-A, NE NE NW section 36-18-8w, Geneseo district, Rice County, found Arbuckle lime at 3,156 feet, set 7-inch casing there and was bottomed at 3,216 feet. It was treated with 2,000 gallons of acid, pumped 449 bbls. of oil the first four hours, 429 bbls. the next four hours and made potential of 2,570 bbls. of oil.

Mid-Plains Oil Co. No. 4 Hauschild, SE NE NE section 15-21-7w, Wherry area, had Arbuckle lime at 3,804 feet, water intruded and it was completed as a salt water disposal well at 3,977 feet, total depth.

Republic Natural Gas Co. No. 2 Oden, SW NW NW section 5-21-7w, an old Wherry well, was plugged back from 3,353 feet to 3,350 feet and recompleted as a 15-bbl. minimum well.

Reno County

Campbell & Davis No. 2 Welch B, C NE SE section 4-24-4w, Burrton district, Reno County, found Chat at 3,296 feet, had pay at 3,344-55 feet, total depth 3,375 feet. Water intruded and it was plugged back to 3,355 feet, acidized with 1,000 gallons and made potential of 901 bbls. of oil, with 90 bbls. of water.

Transwestern Oil Co. No. 3 Teten, NW SW NE section 12-23-4w, was bottomed at 3,453 feet, with Chat pay at 3,351-61 feet. Casing was perforated at 3,354-61 feet, shot and acidized, flowed 88 bbls. of oil in 1½ hours and made potential of 692 bbls.

Same company's No. 4 Teten, SW NW SE section 12-23-4w, was shot and acidized and made potential of 448 bbls. of oil and 1 per cent water. Top of Chat was 3,260 feet, pay 3,348-57 feet, total depth 3,423 feet.

Salt City Gas Co. No. 1 Yoder, SE cor. section 28-24-5w, was a cellar.

Stafford County

Royal Oil & Gas Corp. No. 1 Sittner, NW NW SE section 33-21-12w, Sittner pool, Stafford County, made potential of 1,307 bbls. of oil and was completed at 3,630 feet, total depth. Arbuckle lime was topped at 3,622 feet, with 7-inch casing set on top of lime.

Stanolind Oil & Gas Co. No. 1 Sittner, SW SW NE section 33-21-12w, was drilling below 3,400 feet.

Cowley County

Arthur Brewer No. 1-A Fred Clark, NE SE NW section 6-31-4, in the old Clark pool, northwestern Cowley County, was completed for potential of 116 bbls. of oil. Production was from Bartlesville sand at 2,847-71 feet, total depth 2,874 feet. Five-inch casing was set at 2,840 feet.

E. B. Shawver No. 3 Shawver, SW SE NE section 3-30-4, had Bartlesville sand at 2,810-18 feet and was dry and abandoned at 2,982 feet, total depth.

Chautauqua County

Sagamore Oil & Gas Co. No. 24 Landon & Floyd, C E half SE NW section 32-32-11, northern Chautauqua County, topped Mississippi lime at 1,822 feet, total depth 2,286 feet, plugged back to 1,841 feet and was completed as a 5-bbl. pumper.

Butler County

Adair & Morton No. 3 Brandt, NE NW SE section 15-28-7, Brandt pool, Butler County, found Mississippi lime at 2,674 feet, was bottomed at 2,711 feet, acidized with 2,000 gallons and pumped 75 bbls. of oil in 24 hours.

Woodson County

C. L. Sheedy and others No. 12 Klick, CNL SW SE section 20-25-14, Batesville area, Woodson County, flowed 40 bbls. of oil in 24 hours after a shot and was completed at 1,453 feet, total depth. Top of Bartlesville sand was 1,405 feet.

The Draper pool of the Neosho Falls district, northeastern Woodson County, apparently has been extended three-fourths of a mile eastward into Allen County at Barner & Leiker and Western Kansas Oil & Refining Corp. No. 1 Van Loon, SW section 2-24-17. It was estimated good for 10 bbls. of oil naturally from Mississippi lime at 1,141 feet, total depth 1,163 feet.

(Continued on Page 226)

Oklahoma Operations

By
DAL DALRYMPLE

Testing Hughes Pool Opener; Seminole Wildcat Strikes Oil

The wildcat that opened a new pool in the Calvin district of Hughes County provided the big show in Oklahoma fields the past week, but operations in several other areas were not without interest. Opening of another producing area in Seminole County was indicated; an Atoka County outpost was giving promise of possible production as it drilled deeper and several interesting wildcats were started.

The newest strike in Seminole County was at W. A. Villines No. 1 Swan, NW NE NW section 26-7-5, near the town of Hazel. It had a formation, thought to be Boggy sand, at 2,977 feet and was bottomed at 2,994 feet, with casing set at 2,985 feet. When plug was drilled it showed considerable gas and oil production was estimated at 400 bbls. daily, based on rate of fill-up. Location is between the Konawa area in Seminole County and St. Louis district of Pottawatomie County.

In the Boggy Depot area of Atoka County, Amerada Petroleum Corp. and Stanolind Oil & Gas Co. No. 1 Ridgeway, NW NE NE section 24-3s-9, was coring below 3,470 feet in sandy lime. It had a slight showing of oil in a core at 3,464-70 feet.

Operators continued to test at Phillips Petroleum Co. No. 1 Beeker, NE NW SW section 8-5-10, pool opener in the Calvin area of southern Hughes County, various-sized chokes being used. On most recent test it flowed 75 bbls. of oil through ⅛-inch choke in five hours and 20 minutes, cutting 2 to 4 per cent water. Casing pressure was between 625 to 660 pounds. Production is from plugged-back depth of 5,660 feet, in Viola lime. When opened for initial test earlier in the week, the wildcat flowed 1,134 bbls. of oil in 5 hours and 45 minutes, with gas volume ranging around 2,000,000 feet. Gravity of the oil was 39.8 degrees. On later tests through chokes, production ranged around 20 to 25 bbls. of oil an hour, cutting some water.

Waukomis Oil Corp. No. 1 Clark, NW NW NW section 34-21-6w, discovery well in the Waukomis area, Garfield County, averaged 22 bbls. of oil an hour as operators continued to test through chokes. It was bottomed at 7,335 feet, and was producing through perforations at 7,260-80 feet.

Carter Oil Co. No. 1 Harley, C NW NW section 19-2s-3w, on the Carter County side of the Milroy pool, was bottomed at 8,280 feet in oolitic lime. Although it has been running considerably lower structurally than the deep Stephens County producer that offsets it on the west, cores in the oolitic section indicated probable production. The core-hole was to be reamed and pipe set for completion.

The Ramsey Pool

Wells being drilled in the Ramsey area, Payne County, were making good progress. E. H. Moore, Inc., No. 1 Boyd, NE cor. section 24-18-1e, south of the pool, had Mississippi lime at 4,613-4,719 feet, found Woodford shale at 4,720 feet and was drilling ahead, looking for Viola lime. This test was running lower structurally than the four producers in the field. J. E. Crosbie, Inc., No. 1 Fruin, SE SE NW section 13-18-1e, was drilling below 2,803 feet. It is about one-half mile west of Ramsey production. Sun Oil Co. and others No. 1 Scafe, SE SE NE section 12-18-1e, north of the pool, was bottomed at 964 feet and was reaming to set surface casing. Mid-Continent Petroleum Corp. and others No. 2 Ramsey, NW SW NW section 18-18-2e, was drilling below 1,970 feet, and same operators' No. 2 Columbia, NE NW SW section 18-18-2e, was drilling below 1,725 feet. The last two wells offset producers.

Gulf Oil Corp. No. 1 Thomas, SW NW NW 14-4n-5w, wildcat in Grady County, was bottomed at 11,415 feet and the crew was trying to free stuck drill pipe. It is the deepest test ever drilled in Oklahoma.

The next lease sale of the Five Civilized Tribes will be held at the Indian agency in Muskogee April 7, A. M. Landman, superintendent, announced. Acreage in 17 eastern and southern Oklahoma counties will be offered.

Wildcat Operations

The only three wildcats recorded as completions in Oklahoma the past week were failures.

Gibson & Jennings No. 1 Burleson, SE SE SW section 35-2s-19w, Tillman County wildcat, topped Pontotoc formation at 1,462 feet, lower Cisco 2,868 feet, Canyon lime 3,205 feet, and was dry and abandoned at 3,303 feet, total depth. Salt water was showing in porous lime cores.

Hall & O'Mera No. 1 Shaw, NE NE SE section 32-6-5, Pottawatomie County wildcat, topped Wilcox sand at 3,331 feet, total depth 3,346 feet, and was dry and abandoned.

Chapman & Low No. 1 Hallum, NE NW NW section 4-7s-20, wildcat in Choctaw County, had water in the hole and was abandoned at 815 feet, total depth.

Several new wildcat tests were reported.

Cromwell-Franklin Oil Co. and others No. 1 Holcomb, C SW NW section 34-20-1w, was building rig. This wildcat is in southern Noble County, east of the Lucien field.

In Pawnee County, O. O. Owens and others No. 1 Riddle, C E half E half SW section 8-23-5, southeast of the Ralston area, was building rig.

Farmers' Mutual Royalty Corp. No. 1 School Land, SE SE NW section 16-5-5, northeast of the Bebee area in Pontotoc County, had dug pits.

Greer and others No. 1 Coker, NW NE NE section 25-7-5, northwest of the Dora pool in Seminole County, had dug cellar and pits.

In Garfield County, J. E. Kendall and others No. 1-A State, SW cor. section 13-23-3w, between the Billings and Barnes pools, had spudded. It was to be an 1,100-foot gas test on an Ohio Oil Co. farmout. Paul Williams, Investment Royalties Co. and Big Chief Drilling Co. No. 1 Zollars, SW SW NE section 34-24-3w, north of the Barnes pool and one-half mile south of a 10-bbl. well that has been producing since 1926, had started work.

In Logan County, Sinclair Prairie Oil Co. No. 1 Crews, SW SW NE section 27-16-1e, on a short-term lease east of Meridian, has started work. Major companies hold acreage on the structure.

Shell Petroleum Corp. started work at No. 1 Boley, SE SE SW section 8-11-6, in northeastern Pottawatomie County and south of Prague. Location is on a seismograph high and in an area where considerable royalty has been traded.

In Payne County, Texas Co. No. 1 Longan, NW cor. section 12-17-1e, had dug cellar and pits. Location is near the intersection of Payne, Logan and Lincoln County lines, on a seismograph high.

In Muskogee County, Midco Oil Corp. No. 1 Dunagan, SE SE NE section 31-11-19, northeast of Porum and near the McIntosh County line, was drilling below 810 feet.

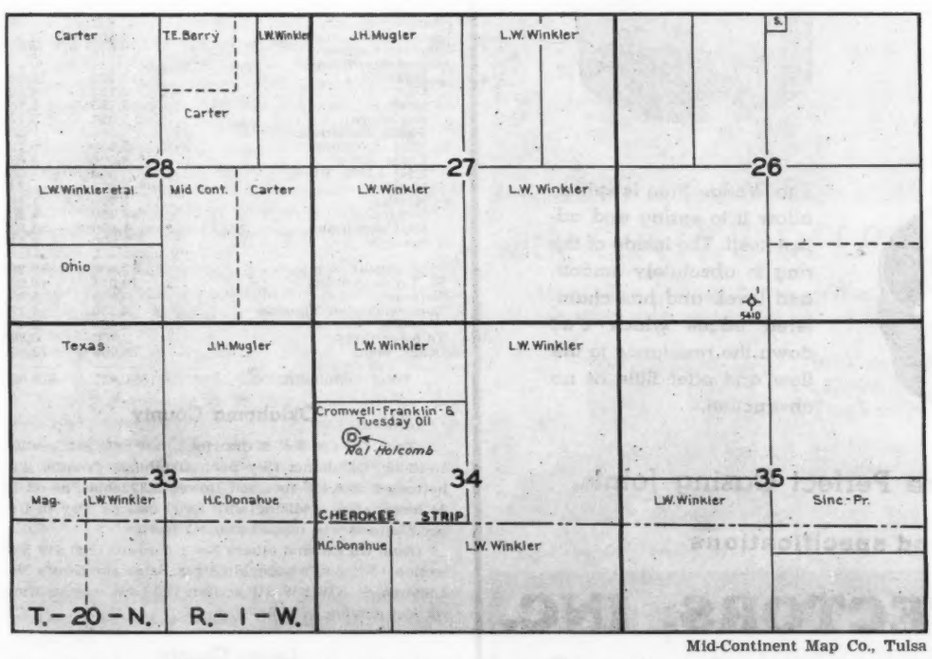
Seminole County

Sinclair Prairie Oil Co. No. 4 Stubbs, NE cor. section 18-9-7, East Seminole pool, Seminole County, had Cromwell sand pay at 3,469-78 feet, total depth 3,481 feet, and swabbed 145 bbls. of oil in 24 hours.

Magnolia Petroleum Co. No. 3 Reed, NE SW NE section 26-5-7, Allen district, pumped 125 bbls. of oil in 24 hours from Cromwell sand pay at 2,790-2,841 feet. It was bottomed at 4,812 feet, plugged back to 3,600 feet and perforated casing to complete in Cromwell sand.

Bryan Petroleum Co. No. 2 Walker, NW SE SE section 4-7-6, had nothing showing and was dry and abandoned at 2,882 feet, total depth.

New work in Seminole County: Troup & Hall No. 3



Mid-Continent Map Co., Tulsa

Cromwell-Franklin and Tuesday Oil Co. have started work at No. 1 Holcomb, section 34-20-1w, Noble County wildcat

Snyder, SE SE NW section 4-6-6, Dora pool, had erected derrick. Winkler & McQueen No. 2 Bruner, SW NW NE section 4-6-6, was drilling below 550 feet. J. F. Smith and associates No. 2 Harryman C, SW SW SE section 33-7-6, was a rig. W. A. Delaney and others No. 1 Swan, SE SW SW section 18-6-6, wildcat west of the Konawa pool on a Gulf Oil Corp. farmout, had spudded. Shephard and others No. 2 Scroggins, SW cor. section 34-7-6, Dora area, was drilling below 320 feet.

R. Lillard and others No. 1-A Barker, NE NW NE section 12-9-5, was an abandoned location.

Summit Drilling Co. No. 1 Wass, SE NE NE section 30-8-7, was drilling below 2,740 feet. It is between the Little River and East Little River pools.

Pottawatomie County

Gulf Oil Corp. No. 1 Benjamin A, SW SE NW section 13-7-4, St. Louis district, Pottawatomie County, was bottomed at 4,164 feet, plugged back to 4,054 feet and drilled out to 4,085 feet to complete. After acidizing, it pumped 216 bbls. of oil in 24 hours and flowed 110 bbls. through tubing in 24 hours. Gravity of the oil was 40 degrees. Production was from Simpson pay at 3,992-4,085 feet.

Mid-Continent Petroleum Corp. and others No. 1 McClellan, SW SW NW section 19-11-5, was dry and abandoned at 4,904 feet, total depth. Top of Wilcox sand was 4,881 feet.

The old St. Louis district is being given a working over by operators, six new locations being announced the past week. Several old wells also are being reworked.

Alma Oil Co. No. 1 Shaffer, NE NE SE section 32-7-5, was a location. Same company's No. 1 Curley, SW SW NW section 33-7-5, had dug cellar and pits. Gulf Oil Corp. No. 3 Barton, NW NE NW section 13-7-4, had dug cellar and pits. Magnolia Petroleum Co. No. 5 Caudle, NW NE SW section 13-7-4, was moving in tools. Same company's No. 5 Richardson, NE SW SW section 15-7-4, was building rig. Magnolia Petroleum Co. No. 2 Lynn, NE cor. section 21-7-4, twin to No. 1 Lynn, was a location.

Magnolia Petroleum Co. No. 3 Billington, NE NE NW section 22-7-4, an old well, was plugged back from 3,800 feet to 3,454 feet, shot Calvin sand pay at 3,222-3,313 feet and flowed 175 bbls. of oil with an estimated 2,000,000 feet of gas in 24 hours.

Tellico Oil Co. No. 3 Brister, SW NW NE section 28-7-4, an old well, was plugged back to 3,954 feet, ripped casing at 3,700-3,850 feet and shot at 3,485-3,505 feet, flowing 27 bbls. of oil in 24 hours from Calvin pay at 3,460-3,505 feet.

Alma Oil Co. and others No. 1 Smith, SE SE NE section 32-7-5, was bottomed at 4,505 feet, pumped 842 bbls. of oil and 121 bbls. of water in 24 hours and was testing.

Stanolind Oil & Gas Co. and others No. 6 Rushing, NW SW SE section 32-11-4, was a near completion in the Shawnee pool. Seven-inch casing was set at 4,385 feet, total depth 4,406 feet in Earlsboro sand.

Pontotoc County

Kerlyn Oil Co. No. 1 Nix, C E half NW SE section 1-1n-7, Jesse area, Pontotoc County, had Hunton lime pay at 3,898-4,230 feet, total depth 4,240 feet, was acidized and flowed 136 bbls. of oil net in 24 hours.

F. W. Merrick No. 3 Balthrop, SE NE SE section 10-4-6, Ada district, plugged back from 1,162 feet, total depth, to 799 feet, perforated casing and produced an estimated 2,000,000 feet of gas from gas sand at 750-751 feet.

Patsy Oil Co. No. 2 Mayhue, NE NE SE section 20-2-6, and same company's No. 2 Mehard-West, SW SE SW section 21-2-6, were abandoned locations in the Fitts district.

Clark & Cowden No. 2 Starrett, SE NE NE section 21-5-5, Beebe area, was a location. J. L. Cowley No. 2 Malloy, SW NE SW section 30-5-5, set surface pipe at 40 feet.

Estimated Daily Production

Estimated daily production for Oklahoma, for the week ending March 26, and for the preceding week, was as follows:

	Barrels	
	Mar. 26	Mar. 19
Allen	5,525	5,775
Billings	7,800	7,975
Burbank	7,525	7,500
South Burbank	11,250	10,600
Balance Osage	18,750	18,500
Blackwell district	5,450	5,375
Bristow-Slick	6,875	6,750
Chandler	2,375	2,350
Crescent	7,100	7,500
Cromwell	3,275	3,200
Cushing-Shamrock	10,500	10,400
Duncan district	3,750	3,625
Edmond	7,075	6,725
Fish	4,025	4,325
Fitts	60,750	60,825
Jesse	3,850	3,625
Graham	5,200	5,350
Gray	1,050	1,025
Healdton	9,375	9,325
Hewitt	4,125	3,975
Keokuk	6,650	6,250
Konawa	1,650	1,525
Lucien	13,025	12,750
Moore	7,300	7,050
Oklahoma City	109,450	125,100
Olympic	6,875	6,925
Ramsey	825	800
Sasakwa	1,800	1,825
Sholem-Alechem	2,975	2,875
Seminole district:		
Bowlegs	10,125	10,025
Carr City	4,125	4,150
Dora	5,725	5,750
Earlsboro	5,325	5,750
South Earlsboro	600	600
East Earlsboro	5,650	5,725
Little River	8,600	8,675
East Little River	950	950
Maud	825	825
Mission	1,725	1,825
Seminole	8,250	8,600
East Seminole	1,800	1,825
Searight	3,600	3,550
Total Seminole	57,300	58,250
St. Louis-Pearson	19,075	18,925
Tatums	3,850	3,800
Tonawa-Garber-Thomas	4,250	4,275
Wewoka	2,425	2,450
Yale-Jennings	3,750	3,700
Other pools	78,000	73,800
Total Oklahoma	504,825	519,025

Oklahoma County

Olson Oil Co. No. 2 Crawford, NW NE SW section 15-12-3w, Oklahoma City pool, Oklahoma County, was bottomed at 6,475 feet and flowed 2,322 bbls. of oil in 24 hours after acidizing with 6,000 gallons. Pay in Upper Simpson was topped at 6,345 feet.

Olson Oil Co. and others No. 1 Johnson, NE SW SW section 15-12-3w, was building rig. Same company's No. 2 Slaughter, NW NW SW section 15-12-3w, was building rig and moving in tools.

Logan County

Amerada Petroleum Corp. and Stanolind Oil & Gas Co. No. Knight, NE SE SW section 12-17-1w, Lang-

WELD CASING ECONOMICALLY with WEDGE CHILL RINGS

WEDGE Chill Rings save time and money in welding casing strings because they:

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ston area, Logan County, flowed 65 bbls. of oil in six hours and was completed for potential of 216 bbls. of oil, with 705,500 feet of gas. First Wilcox sand was topped at 5,035 feet, total depth 5,100 feet.

Osage County

Oklahoma Natural Gas Co. No. 1,949 Osage, NW NW SW section 17-20-12, Osage County, was completed as a 9,000,000-foot gas well in Burgess sand at 1,820-26 feet, total depth.

Ray Branstetter No. 1 Osage, SW NW SE section 23-22-11, had Arbuckle lime at 2,208 feet and was dry and abandoned at 2,218 feet.

Pure Oil Co. No. 106 Osage, SE NE SW section 9-23-8, an old well, was deepened from 2,272 feet to 2,375 feet, shot and swabbed 27 bbls. of oil in eight hours, swabbing off.

New work in Osage County: Carter Oil Co. No. 3 Osage, NW SE NW section 16-25-6, location; Wolverine Oil Corp. No. 6 North Avant Unit, NE NW SE section 31-24-12, an old well, deepened and shot at 1,735-54 feet; same operator's No. 8 North Avant Unit, NE NW SE section 31-24-12, an old well bottomed at 1,723 feet, moving in material to deepen; same operator's No. 12 North Avant Unit, SE NW SE section 31-24-12, an old well bottomed at 1,750 feet, testing.

Okmulgee County

Lease Investment Co. No. 1 McAllister, NW NE NW section 6-14-11, Okmulgee County, topped Wilcox sand at 3,084 feet, water intruded at 3,095 feet and it was abandoned at 3,500 feet, total depth.

Operations in Okmulgee County reported for the first time: Ray Vincent No. 1 Burt, NW SE SE section 6-13-11, moving in machine; Browning & Potter No. 1-A Watson, NW NE NE NW section 5-13-14, spudded; Ed Smith and others No. 2 Keaton, NE SE NE section 1-14-12, location; L. V. Richardson No. 1 fee, NE SE SW NW section 30-14-13, machine; C. R. Colpitt No. 9 Buchanan, SW NE SE section 31-15-14, set 8¼-inch casing at 1,023 feet.

Muskogee County

J. R. Parks No. 1 Hilderbrand, SW NW SE section 17-14-19, Muskogee County, had a hole full of water at 656 feet, total depth, plugged back to 650 feet and produced 750,000 feet of gas.

Garvin County

Simpson-Fell Oil Co. No. 11 Derdeyn, SE SW NW section 17-1n-3w, Robberson pool, Garvin County, had Pontotoc sand at 1,560-1,647 feet, total depth 1,700 feet, and pumped 12 bbls. of 22-gravity oil daily.

Carter County

Shell Petroleum Corp. No. 17 Horton, SW SW NE section 6-4s-3w, Healdton field, Carter County, had Deese formation at 1,017-1,152 feet, total depth, was shot and pumped 30 bbls. of oil daily.

Sun Oil Co. No. 18 Mullem A, NW SW NE section 4-4s-3w, was shot and pumped 27 bbls. of oil daily. It had Deese formation at 869-997 feet, total depth 1,064 feet and plugged back to 1,000 feet.

Gulf Oil Corp. No. 1 Smith, C SW SW section 26-2s-3w, one of the deep producers in the Fox field, was deepened from 7,773 feet to 7,920 feet and flowed 648 bbls. of oil and 114 bbls. of water daily through bottom-hole choke on tubing. Production was from Oolitic lime at 7,672-7,902 feet.

Phillips Petroleum Co. No. 1 McCrory, NE NW SE section 5-1s-3w, was a location in the Tussy pool. Rockland Oil Co. No. 59 Sarasota, NE cor. section 23-4s-3w, was drilling at 270 feet.

Kiowa County

R. H. Burns and others No. 3 Webster, NE cor. section 2-6-17w, Kiowa County, was dry and abandoned at 1,130 feet, total depth, in Granite Wash.

Principle Oil Co. No. 1 Carlton, SE SE NW section 26-7-20w, was a temporarily abandoned location.

W. D. Waggner No. 1-A Pfenning, SE cor. section 35-7-17w, had spudded with machine.

Caddo County

Phillips Petroleum Co. No. 1 Royce, NW NE NE section 12-5-9w, was location for a new test in the Cement field.

J. B. Nichlos Nos. 3 Rigney, NE NW SE section 12-5-9w, an old Cement well being deepened from 3,348 feet, was fishing for drill pipe at 3,675 feet.

Willard L. Miller No. 2 Garner, SW NW SW section 26-6-10w, west side of the Cement field, showed for an oil producer through perforations at 3,995-4,028 feet, and was running tubing and making connections.

Magnolia Petroleum Co. No. 8 Hedlund, NE NW NE section 11-5-9w, on east side of the pool, set casing at 5,352 feet, total depth 5,404 feet, and was preparing to bail.

Darby Petroleum Co. No. 1 Loose, NE SE SE section 27-6-10w, set casing at 4,849 feet. It had sand at 4,830-50 feet, total depth.

Olson Oil Co. and W. L. Kistler No. 2 Rigney, NE NE NW section 12-5-9w, was drilling below 4,000 feet. Phillips Petroleum Co. No. 1 Yule, SW NW SW section 1-5-9w, was drilling around 3,000 feet.

Scattered First Reports

In the Sac & Fox area, Lincoln County: Wilcox Oil & Gas Co. No. 1 Fitch, SW NW NE section 15-14-6, had erected rig and was moving in tools. Sinclair Prairie Oil Co. No. 3 Buckles, NW NE SE section 15-14-6, was bottomed at 2,928 feet, and rigging up standard tools. Helmerich & Payne No. 6 Fitch, NE SW NE section 15-14-6, was a rig.

In Payne County, Sun Oil Co. No. 2 Sherman, NE NW SW section 14-19-5, Yale district, was rigging up rotary.

In Creek County, Cash Theodore No. 1 Carr, NE cor. section 26-18-9, was fishing at 1,478 feet, total depth; A. B. Ice No. 2-A Adams, SW SW SE section 18-17-10, topped Bartlesville sand at 2,331 feet, had a showing of oil and was drilling at 2,344 feet.

In Wagoner County, A. Pepis No. 1-A Corder, NW NW NE section 17-16-15, was a location.

In Okfuskee County, Grimes & Neil No. 4-A Alexander, SW SE NE section 35-11-9, had spudded; C. A. Sivils No. 3 Robinson, NW NW SE section 21-12-11, was building derrick.

In Jefferson County, Rips & Ungerman No. 6 Black, SE SW NE section 16-7s-5w, had spudded.

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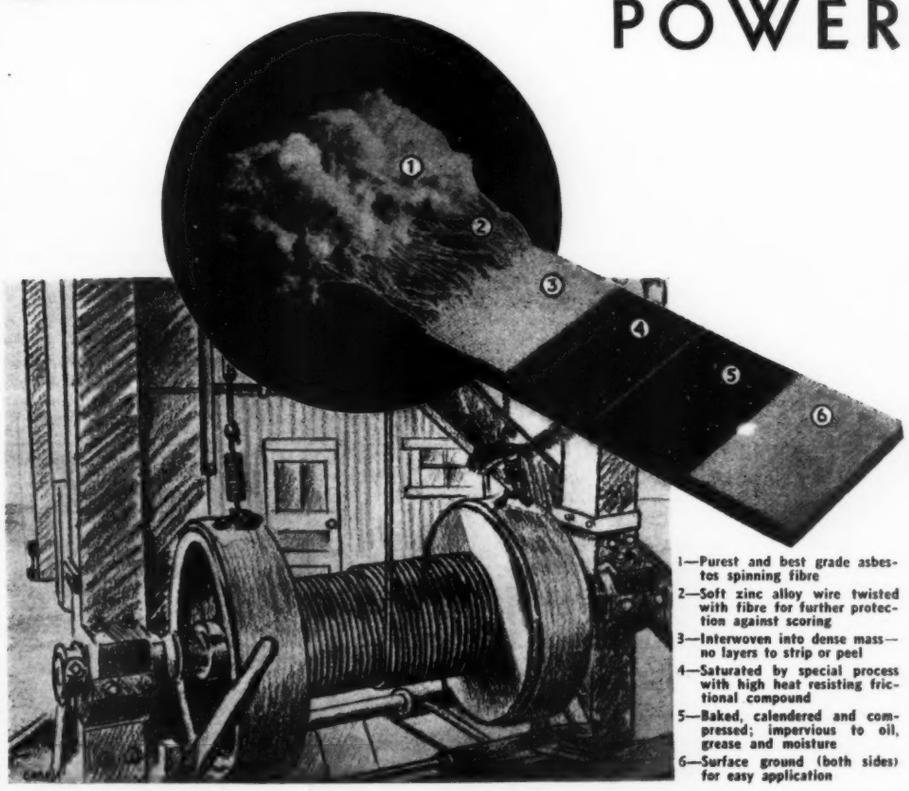

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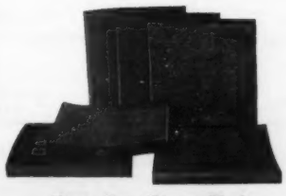

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West, Central and Panhandle Texas

By MITCHELL TUCKER

Slaughter, Hockley County, Completes Its Largest Well

FORT WORTH, Tex., Mar. 28.—The completion of the largest producer in the Slaughter field of Hockley County, and a promising 1-mile southwestern extension, served to keep the North Permian Basin territory foremost in the interest of West Texas operators last week.

Honolulu Oil Corp. No. 1-51 Alex A. Slaughter Estate gauged 917 bbls. officially on 24-hour test through 2-inch tubing, after acidizing the lime with 9,000 gallons, by stages to the total depth. Gulf Oil Corp. No. 1 Gordon, about 1 mile southeast of Slaughter production, offers the probable extension, after swabbing and flowing at the rate of 120 bbls. daily while drilling. First oil was encountered in a porous zone at 4,970-75 feet and increases have been noted to a depth of 5,071 feet where drilling continues. The Gulf company's effort to extend Slaughter production 2 miles to the southwest in No. 1 Mallett Land & Cattle Co. appears to have been unsuccessful, as only salt water has been recovered to its present total depth of 5,100 feet.

Andrews County Prospect

The possible new field in central Andrews County, 3 miles west of the Fuhrman pool, continues attractive. Seaboard Oil Corp. No. 1 Thornberry has topped the Yates sand marker 85 feet higher than in its No. 1 Munger and Nix, 3 miles further to the west. The latter well made several large heads of oil after having been acidized by stages with 10,000 gallons. It swabbed at the rate of 5 bbls. of oil hourly. While the Munger and Nix well was still testing, No. 1 Thornberry was started as an immediate test between that point and the Fuhrman pool. Further encouragement was given by high gas pressures found in the Yates horizon. This well is now drilling at 3,300 feet, in anhydrite.

Further exploration of the small one-well Kirk field in Gaines County seems assured after the announcement of two wildcats nearby. Kirk is about midway between the Means and Seminole fields. One and one-half miles northwest of its discovery well at Kirk (now a small pumper) Landreth Production Corp. is moving in heavy rotary for the drilling of No. 1 Paul W. Dalmont. About 5 miles west by northwest of Kirk, Finley & Cherry and others are rigging up No. 1 P. W. Dalmont. Humble, Ohio and Cities Service companies have contributed toward this test.

Extending the Seminole field's productive limits 1 mile to the east, Amerada Petroleum Corp. No. 1 R. W. Robertson gauged 146 bbls. daily through 1½-inch tubing choke after treating with 5,000 gallons of acid. Total depth is 5,100 feet, in a sidetracked hole, where tools were lost at the original total depth of 5,112 feet. Top of saturation was 5,007 feet.

A Gaines County Disappointment

Shell Petroleum Corp.'s efforts to extend the southern limit of the Wasson field in Gaines County 1½ miles east were unsuccessful, and they have abandoned No. 1 M. B. Robertson at a depth of 5,333 feet. Only sulfur water was found. The establishment of the water level at Wasson will be assisted by findings in this well.

As the fourteenth producer in the Bennett field of southwestern Yoakum County, Texas Pacific Coal & Oil Co. No. 6 Bennett, rated a high potential of 1,604 bbls. last week, flowing through open 7-inch casing, after shooting with 720 quarts of nitroglycerin from 5,065 to 5,275 feet, total depth.

Central Basin

Sinclair Prairie Oil Co. No. 1 Paul Moss, 2-mile southwest outpost for the Harper pool of Ector County, topped the reliable Yates sand marker favorably last week, and continues to drill below 3,200 feet, in anhydrite.

Humble Pipe Line Co. is enlarging its facilities in Ector County to care for increased production at Harper and Foster. A parallel 6-inch line is being laid alongside their 8-inch gathering line through the area.

A new pool may be opened in Crockett County between the Yates and McCamey fields. Choate & Hogan No. 1 University, a wildcat in the extreme northeast corner of the county, is showing oil in sandy lime at 1,457-67 feet, present total depth. Pipe is to be set for testing.

Ordovician Tests

Humble Oil & Refining Co.'s western Tom Green County deep exploratory hole, No. 1 Lewis & Wardlaw, has drilled 143 feet into the Ellenburger without oil or water showings. Drill stem test taken last week from 6,991 to 7,044 feet showed only drilling mud and slight sulfur gas. Coring continues below 7,132 feet.

Magnolia Petroleum Co. and Tex-Mex No. 1-A McKee, closely watched deep wildcat in the Imperial area of northern Pecos County, is pulling 7-inch casing to replace a defective joint, total depth 5,444 feet. This well is still in the Simpson of Middle Ordovician, where a few attractive flows of oil were made from the upper portion of the section.

Floyd C. Dodson No. 1-A Texas-American Syndicate. Brewster County deep test on the Hovey dome, has been unsuccessful in recovering lost tools at 7,751 feet. Whipstock is being set in preparation to deepen into the Simpson zone, topped at 6,733 feet.

WEST CENTRAL TEXAS

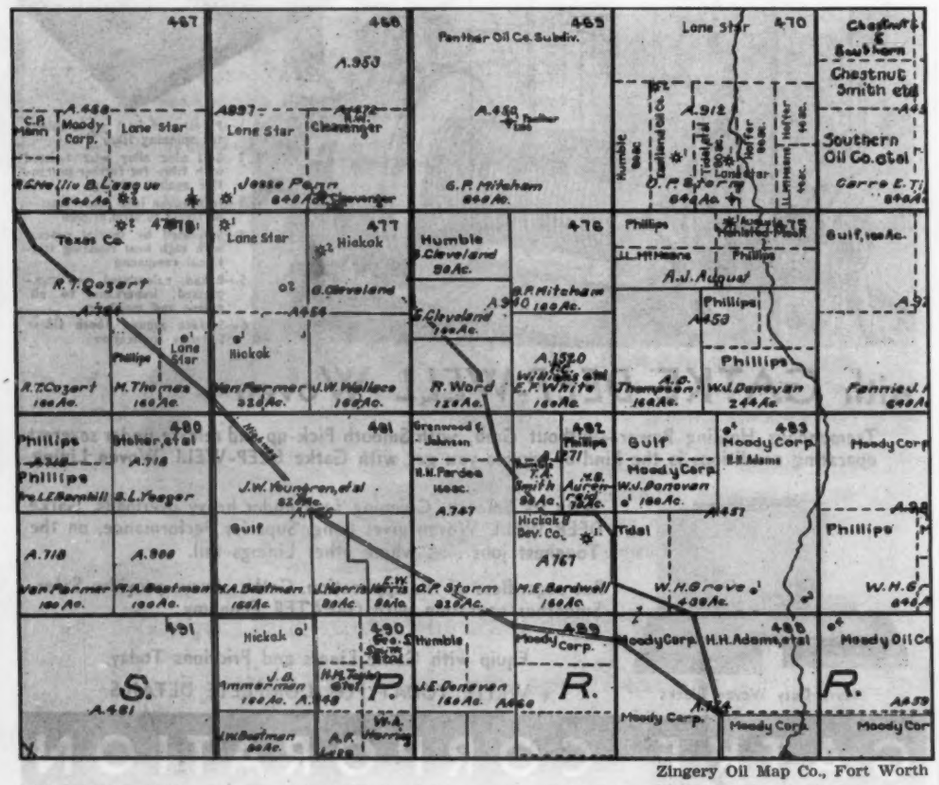
Showing of a northeast outpost to the shallow Ivy pool in northwestern Shackelford County and completion of the same area's second deep Palo Pinto lime oil producer put new interest last week into the northeast trend play from Jones County's Avoca field.

Iron Mountain Oil Co. ran casing to test the King sandy lime in its No. 2 D. A. Ivy, approximately a quarter mile northeast of the shallow production, after topping a heavy gas flow at 1,900 feet. In the SE NW SW section 159, B.B.B.&C. Survey, it is one location east of a dry hole finished last year.

Danciger Oil & Refineries No. 2 J. E. McCown cored saturated Palo Pinto lime from 3,189 to 3,206 feet and after cementing pipe, cored again to 3,212 feet with an increase. Fluid rising 1,500 feet in the hole was not lowered by swabbing through casing, but the operators were considering acid treatment. It is in the SE cor. section 158, B.B.B.&C. Survey. The east offset, Owens-Snebold No. 4 Ivy, was waiting for gauge with pay at 1,924-43 feet, and the southeast offset, Iron Mountain No. 1 Beck, made 150 bbls. in eight hours after acidization from 1,929-37 feet.

White & Duncan of Wichita Falls moved rig to location for a 3,100-foot wildcat, No. 1 Reynolds Cattle Co., in southwestern Throckmorton County, 330 feet out of the SW cor. NW quarter of Comanche Indian Reservation Survey No. 83, further indicating a prospective play to follow the Young and Jack County horizons into the southern part of the district.

In southwestern Stephens County, Lone Star Gas Co. prepared to spud its No. 5 R. W. Brooks as a possible test of Ellenburger lime 2½ miles north of the Van Parmer Ordovician pool in Eastland County. No. 5 Brooks is nearly a quarter mile north of a 3,400-



Zingery Oil Map Co., Fort Worth

West Central Texas' important Ordovician pool, the Cisco Lake field in the extreme northwestern corner of Eastland County. Hickock Oil & Gas Co. and Lone Star Gas Co. have four Ellenburger producers here, and three drilling

LIFE BEGINS for pump liners

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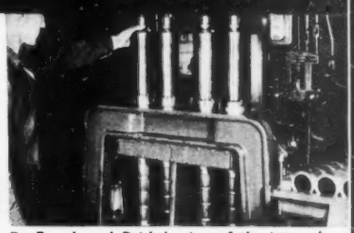
Out of the 103 different manufacturing operations and inspections necessary to the production of finished Axelson Liners these views have been selected to illustrate definite factors. First, these candid views are indicative of complete engineering and manufacturing facilities—second, they express Axelson's painstaking attention to details—third, they exemplify the metallurgical research, the laboratory control and the constant testing carried on as a part of all Axelson Liner manufacturing.

Axelson Liner processes shown are on the regular cast iron only, but Axelson Liners are also available in hardened cast iron, Super-cast iron, Nitri-cast iron and hardened steel Super-Service types. In each will be found design, construction and metallurgical features that make Axelson Liners the oil industry's best buy.

1. Sand molds for liner castings are produced from accurate patterns. Prior to actual pouring operations the previously made cores are placed in the liner molds.

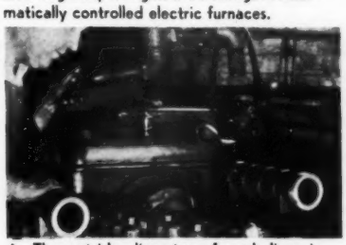
2. Internal strains set up in casting Axelson liners are relieved by a normalizing treatment involving the placing of the castings in automatically controlled electric furnaces.

6. High hydraulic pressures are used in testing Axelson liners for any possible porosity. This equipment is designed and built to Axelson specifications.

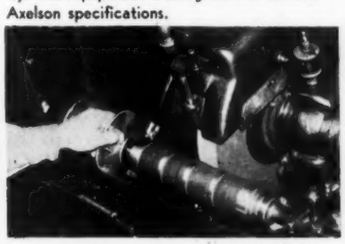


7. Rough and finish honing of the internal surface of Axelson liners produces not only a high polish but establishes a definite size to A. P. I. specifications.

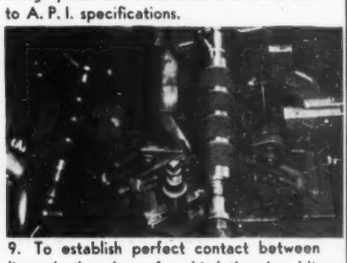
3. In the first machining operation both end faces of Axelson liners are milled simultaneously in specially tooled duplex milling machines.



4. The outside diameter of each liner is machined to a predetermined size for subsequent grinding. This operation is performed in special lathes.



8. The previously turned outside diameter of each liner is now ground to finished size and predetermined tolerances.

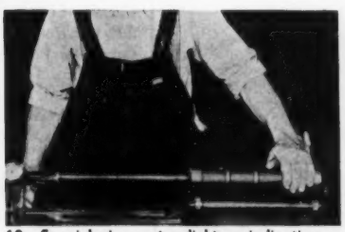


9. To establish perfect contact between liners, both ends are faced in lathes. In addition, the liners to be used at the top and bottom of pumps are belled.

5. The internal machining of Axelson liners involves, among others, rough, semi-finish and finish boring operations. For this work special fixtures are used to insure maximum accuracy.

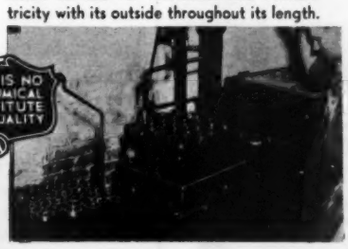
10. The corners between bore and end faces are slightly rounded to avoid sharp edges on the finished liners.

11. The internal diameter of each liner is checked with "Go" and "No Go" gauges to verify correctness of machine operations. Visual inspection is made on inside surfaces.



12. Special micrometer dial type indicating gauges are used for checking the entire inside surface for roundness and concentricity with its outside throughout its length.

13. End faces are checked for smoothness with thumb and squareness by using a straight edge in conjunction with a specially lighted background.



14. The liners are cleaned in vapor-type de-greasing equipment and are immersion-coated with a rust-preventive solution.

15. Liners are either boxed for immediate shipment or placed in indexed storage for ultimate pump assembly.

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foot Caddo lime oil producer completed two years ago and in the vicinity of several shallower gas wells 6 miles east of Moran. It is near the center of section 54-7, T.&P. Survey.

Setting of a screened liner in Hal Hughes and others No. 1 Poindexter, southwestern Callahan County deep Ellenburger discovery near Oplin, failed to aid materially in boosting production which had dropped to 5 bbls. hourly and operators were rearranging connections. The Ordovician pool opener had rated a high potential on initial flow after 7,000-gallon acidization, but will take a regauge. It is in the George Hancock Survey No. 350. Pay is at 4,368-89 feet.

Jones County's Lewis pool received its first failure with abandonment of J. S. Bridwell No. 1 Carter, south edge well offsetting a natural producer, after it had drilled to 2,250 feet. Between the Sandy Ridge and Lewis pools, the Owens-Snebold No. 1 Rhodes, first Palo Pinto test for the vicinity, logged a high structure on the lower beds and picked a slight showing of oil in the deep lime but was abandoned at 4,007 feet. It is in section 31-15, T.&P. Survey.

PANHANDLE

Nineteen wells were started in the Panhandle area last week, as compared to the average of about 10 per week over the last few months. Twelve new wells were completed there last week, 10 for oil and 2 as gassers. Gray County Production Co. No. 4 Chapman recorded a high potential by flowing 1,952 bbls. on gas lift. Aggregate potential from the 10 new oil producers totaled 6,978 bbls.

WEST TEXAS COMPLETIONS

(24-hour gauges)

Andrews County

Fuhrman Petroleum Co. No. 7 Ford, 4,235-4,459 feet, 2,778 bbls. Humble Oil & Refining Co. No. 39 J. S. Means, 4,500-45 feet, 523 bbls.

Cochran County

Livermore No. 1 Wright, 4,835-4,987 feet, 21 bbls.

Crane County

Continental No. 6-B Cowden, 2,410-2,563 feet, 288 bbls. Gulf Oil Corp. No. 7 Wadell, 6,002-12 feet, 3,655 bbls. Humble Oil & Refining Co. No. 17 Tubba, 4,210-4,440 feet, 1,084 bbls. Snowden & McSweeney No. 3 University, 3,520-37 feet, 544 bbls.

Crockett County

Sindorf & Stone No. 1 A. C. Hoover, dry and abandoned at 2,008 feet. Stewart & Cormas No. 1 Hoover, 1,885-1,931 feet, 92 bbls.

Culberson County

Grisham-Hunter No. 1 C. M. Caldwell, dry and abandoned at 550 ft.

Ector County

Barnsdall No. 6 Cowden, 4,064-4,164 feet, 415 bbls.; No. 9 Foster, 4,100-4,225 feet, 634 bbls.; No. 10 Foster, 4,130-4,230 feet, 1,029 bbls. Broderick & Calvert No. 4 Parker, 4,055-4,171 feet, 2,980 bbls. Devonian Oil No. 2-F Scharbauer, 4,166-4,204 feet, 484 bbls. Gulf Oil Corp. No. 72 Goldsmith, 4,104-95 feet, 44 bbls.; No. 79 Goldsmith, 4,112-4,200 feet, 1,580 bbls. Humble Oil & Refining Co. No. 8-B Scharbauer, 4,208-56 feet, 870 bbls.; No. 9-C Scharbauer, 4,155-90 feet, 102 bbls. Mid-Continent No. 1 Cowden, 4,030-4,165 feet, 2,077 bbls. Phillips-Pure No. 18 C. Cowden, 4,080-4,168 feet, 2,709 bbls.; No. 20 C. Cowden, 4,078-4,168 feet, 4,048 bbls. Tide Water-Atlantic No. 3 Kloh, 4,130-4,238 feet, 453 bbls. Wentz No. 5-D Parker, 4,026-4,216 feet, 1,859 bbls.

Fisher County

General Crude No. 2 Morrow, 3,506-19 feet, 468 bbls.; No. 7 J. A. Young, 2,905-20 feet, 18 bbls.

Gaines County

Amerada Petroleum Co. No. 1 Robertson, 5,007-5,112 feet, 146 bbls. Shell Oil Corp. No. 1 Robertson, dry and abandoned at 5,330 feet.

Howard County

Continental No. 17-A Settles, 1,280-1,309 feet, 484 bbls. R. A. Westbrook No. 1 G. T. West, dry and abandoned at total depth 3,857 feet.

Pecos County

Perry & Rodman No. 1 G. W. Potts, 1,760-1,797 feet, 437 bbls.

Upton County

George F. Getty, Inc., No. 1 Sherk, 2,672-2,680 feet, 1,164 bbls.

Ward County

Gulf Oil Corp. No. 82 Estes, 2,510-2,665 feet, 1,457 bbls. Humble Oil & Refining Co. No. 33 Richter, 2,848-2,934 feet, 573 bbls. Johnson-Morrison No. 2 Cummins, 2,150-2,235 feet, 68 bbls. Texas Pacific Coal & Oil Co. No. 24 James, 2,290-2,511 feet, 353 bbls.

Winkler County

Gulf Oil Corp. No. 14 Keystone, 3,375-3,490 feet, 494 bbls. Magnolia Petroleum Co. No. 141 Walton, 2,848-2,954 feet, 1,430 bbls.; No. 143 Walton, 2,835-2,944 feet, 1,619 bbls.

Yoakum County

Honolulu Oil-Cascade No. 2 Bennett, 5,155-5,272 feet, 564 bbls. Toddie L. Wynne No. 2 Willard, 4,814-5,009 feet, 409 bbls.

WEST CENTRAL TEXAS COMPLETIONS

Jones County

Fain-McGaha Oil Corp. No. 3 Mrs. L. E. Williams flowed 310 bbls. after 40-quart shot at 1,919-47 feet, total depth, Lewis pool.

J. S. Bridwell No. 1 C. L. Carter, abandoned dry at 2,250 feet, total depth, Lewis pool.

Jack Burleson No. 1 T. J. Lotspeich, abandoned dry at 2,317 feet, total depth, wildcat.

Roeser & Pendleton No. 1 Badgett Heirs, abandoned dry at 2,400 feet, total depth, Sandy Ridge pool.

Owens-Snebold Oil Corp. No. 1 Mrs. Alice Rhodes, abandoned dry at 4,007 feet, total depth.

Ungren & Frazier No. 17-C Dorsey pumped 116 bbls. daily, depth not given, Hawley field.

Lewis Production Co. No. 13 Henry Sayles pumped 147 bbls. daily, depth not given, Sayles field.

Fisher County

General Crude No. 2 W. L. Morrow pumped 468 bbls.

(Continued on Page 217)

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Central West

By STAFF CORRESPONDENT

Thirty Wells Are Completed in Illinois; Centralia Leads

MATTOON, Ill., Mar. 28.—The Central Illinois fields experienced the busiest week since the first well was brought in in the Patoka pool early in 1937. Thirty wells were completed of which 24 were oil wells with a combined initial production of 7,668 bbls. The remaining six completions were dry holes in Richland, Clinton, and Randolph counties, the last mentioned having been Mabee Consolidated Corp. and others' deep test, which quit with a hole full of water at 3,640 feet. Two other wells that looked hopeless were not abandoned definitely, Kingwood Oil Co. and others No. 2 Allen in C W half SE NW section 27-4n-10e, Richland County, with no showings of oil at 3,095 feet, and Vermilion Oil Co. No. 1 J. S. Smith Estate, near NE cor. NW SW NW section 20-3n-8e, Wayne County, which is at a total depth of 3,075 feet, with no oil showing.

Reports of new work continued to more than keep pace with the completions. This was particularly true of the new Centralia field in Clinton County close to the Marion County line. In the past week exploratory work overflowed into Marion County in Township 1n-1e. New capital is pouring into the field and unfamiliar names of owners are being added to the list of operators weekly. Centralia is one of the liveliest oil towns in the county at this time and the results of drilling west of the city fully warrant the interest being taken in the area which up to now is undefined as to its productive limits.

The Illinois Pipe Line Co. and the Standard Oil Co. of Ohio are taking the production from the Centralia field. Last week's completions with their sand records and initial 24-hour production are given below by county:

In Richland County, B. C. Morrison No. 1 Conour, C N half NW NW section 34-4n-10e, dry and abandoned at 3,099 feet. Pure Oil Co. No. 5 C. T. Montgomery B, C N half NW NW section 4-3n-9e, pay at 2,937-52 feet, flowed 2,421 bbls. of oil in 24 hours; No. 2 Fleming A, CSL SW SE SE section 8-3n-9e, pay at 2,945-60 feet and 2,965-70 feet, acidized with 5,000 gallons, pumped 12 bbls. of oil in 12 hours and pumped off. Kapschull No. 1 Patterson, NE NW NW section 16-3n-9e, dry and abandoned at 3,112 feet. Southern Illinois Petroleum Co. No. 2 Allard, SE NW NW section 16-3n-9e, dry and abandoned at 2,982 feet. De Kalb Syndicate No. 1 Schafer, near NE cor. NE SE NE section 17-3n-9e, dry and abandoned at 3,100 feet. Parshall & Graham No. 1 Miller, SW NE NE section 17-3n-9e, pay at 2,946-52 feet and 2,960-63 feet, acidized with 3,000 gallons, pumped 125 bbls. of oil in 24 hours. Pure Oil Co. No. 4 C. T. Montgomery B, C E half SW NW section 4-3n-9e, pay at 2,926-40 feet, flowed 1,636 bbls. of oil in 24 hours.

Clinton Completions

In Clinton County, Brookside Oil Co. No. 1 Dodillet, SE SW NE section 21-1n-1w, a wildcat, Benoist sand at 1,416-20 feet, water, abandoned. J. D. Reynolds No. 1 Huntington and others, SW cor. NW SE NE section 13-1n-1w, Benoist sand at 1,354-75½ feet, shot with 15 quarts, pumped 220 bbls. of oil in 24 hours. Kesl & Fox No. 1 Storer, SW cor. NW NE NE section 13-1n-1w, Benoist sand at 1,357-88 feet, pumped 165 bbls. of oil in 24 hours. B. M. Hastings and others No. 1 Batteson & Gambill, NE cor. SW SE NE section 13-1n-1w, sand at 1,355-75 feet, pumped 200 bbls. the first day. H. & H. Drilling Co. No. 1 Duncan, NW cor. NE SE NE section 13-1n-1w, sand at 1,366-73 feet, shot with 10 quarts, pumped 380 bbls. the first day. Bailey and others No. 1 Maxfield, SW cor. SE NE section 13-1n-1w, sand at 1,356-79 feet, shot with 10 quarts, swabbed 350 bbls. of oil in 24 hours. Adams Oil & Gas Co. No. 1 Peter Heirs, near NE cor. NW NE section 13-1n-1w, sand at 1,351-76 feet, shot with 20 quarts, pumped 151 bbls. in 24 hours; No. 2 Hefter Heirs, NE cor. SW NE section 13-1n-1w, sand at 1,356-75 feet, shot with 20 quarts, pumped 124 bbls. in 24 hours; No. 1 Geary Heirs, NE cor. NW SE section 13-1n-1w, sand at 1,382-97 feet, shot with 25 quarts, pumped 66 bbls. of oil the first day and 54 bbls. of oil and 4 bbls. of water the second day. Rourke & Moore No. 1 Sangerfeldt & Westman, SW cor. SE NE section 13-1n-1w, sand at 1,361-89 feet, pumped 120 bbls. of oil in 24 hours. Thompson & Self No. 1 Hanseman, SE NW NE section 12-1n-1w, sand at 1,360-91 feet, pumped 348 bbls. of oil and 10 bbls. of water the first day, 416 bbls. of oil and 12½ bbls. of water the second day and 300 bbls. of oil each on the third and the fourth day, with 12 bbls. and 8 bbls. of water respectively. Carter Oil Co. No. 1 Buehler, near C SW NE SW section 12-1n-1w, sand at 1,360-80 feet, shot with 20 quarts, pumped 172 bbls. of oil and 18 bbls. of water. G. A. Blankenship and others No. 1 Roth, SE cor. SW SE section 12-1n-1w, sand at 1,360-87 feet, pumped 175 bbls. Adams Oil & Gas Co. No. 4 Schmitz, NE NE SE section 2-1n-1w, sand at 1,326-47 feet, shot with 15 quarts, pumped 56 bbls. of oil and 4 bbls. of water.

In Marion County, Muhlbach & Pray No. 1 Fox, NW cor. section 18-1n-1e, sand at 1,366-88 feet, pumped 160 bbls.

In Randolph County, Mabee Consolidated Corp. and others No. 1 Wilson, CSL NE SE NE section 3-4s-5w, was abandoned at 3,640 feet. It had 1,200 feet of salt water in the hole at 3,636 feet. Trenton rock was topped at 3,150 feet.

In Fayette County, Carter Oil Co. No. 2 A. Clow, C W half SW NE section 15-8n-3e, Benoist sand at 1,485-1,501 feet, shot with 15 quarts, swabbed and flowed 370 bbls. of oil in 24 hours. Carter Oil Co. No. 1 Mary Miller, C W half NW NW section 12-8n-3e, total depth of 3,120 feet, 48 feet below the top of the Devonian lime, plugged back to 1,550 feet, ripped pipe at 1,525-38 feet, shot with 30 quarts, pumped 93 bbls. of oil in 24 hours.

In Clay County, Pure Oil Co. No. 9 Charles Wilkin, SW SW SW section 28-3n-8e, pay at 2,940-88 feet, at intervals, flowed 324 bbls. in 24 hours.

Drilling in Clinton County

Penn Illinois Oil Co. No. 1 Noller, SW NE NE section 28-2n-1w, Benoist sand at 1,441-44 feet and drilling at 1,580 feet. Lilly and others No. 1 Siegler, NW cor. NE NE SE section 12-1n-1w, sand at 1,376-93 feet and 950 feet of fluid in the hole, cleaning out. Max Conry and others No. 1 Petrea, SW cor. SE SE SW section 12-1n-1w, set 7-inch casing at 1,362 feet and drilling plug. Shell Petroleum Corp. No. 3 Buehler, NW NE NW section 12-1n-1w, drilling at 1,330 feet. Penn Illinois Oil Co. No. 1 Langenfield and others, SE cor. NE SE section 12-1n-1w, rig up. Shell No. 2 Pitchford, SW NE SW section 1-1n-1w, sand at 1,314-29 feet, set 4½-inch casing at 1,306 feet; No. 3 Koelmel, NE SW SW section 1-1n-1w, sand at 1,308-43 feet, set 5¾-inch casing at 1,303 feet; No. 2 Koelmel, NW SW SW section 1-1n-1w, sand at 1,335-61 feet, shot with 15 quarts, cleaning out; No. 2 Buehler, SW SE SW section 1-1n-1w, sand at 1,333-59 feet, set 4½-inch casing at 1,330 feet. A. B. Ryan No. 1 Besant, SE cor. NE NE SE section 13-1n-1w, building derrick. I. T. Eason and others No. 1 Home Building & Loan, SW cor. NE SE NE section 13-1n-1w, building derrick. Seligna Oil Corp. No. 1 Condit and others, NW cor. SW SE NE section 13-1n-1w, drilling at 185 feet.

John Pugh Drilling Co. No. 1 Myers, NW cor. NE SE section 13-1n-1w, rigging up rotary. A. B. Ryan No. 1 Home Building & Loan, NE cor. SE NE section 13-1n-1w, rig up. H. H. Weinert No. 2 fee, NE cor. SW NE NE section 13-1n-1w, drilling at 400 feet. J. D. Reynolds No. 1 Tate, NE cor. SE NE NE section 13-1n-1w, drilling at 1,100 feet. Rufus H. Blowers No. 1 City Park, near C SE NW NE section 13-1n-1w, rigging up rotary. Adams Oil & Gas Co. No. 1 Peter Huss B, SW cor. NE NE SE section 13-1n-1w, set 10¾-inch casing at 95 feet; No. 6 Hefter Heirs, SW cor. NW NE section 13-1n-1w, rig up. Kesl & Fox No. 2 Storer, NE NE NE section 13-1n-1w, Benoist sand at 1,364-65 feet, total depth, 7-inch casing set at 1,363 feet. Adams Oil & Gas Co. No. 2 E. B. Marshall, SE cor. SW section 12-1n-1w, drilling at 930 feet.

Thompson & Self No. 1 Hanseman, SE cor. NW NE section 12-1n-1w, drilling at 1,100 feet. Carter Oil Co. No. 2 Buehler, NW cor. NE SW section 12-1n-1w, location. Lillys, trustee, No. 1 Meyers, SE cor. section 12-1n-1w, drilling at 636 feet. Bryant & Beaver and others No. 1 Karlan, NE cor. SE SW SE section 12-1n-1w, moving in material. Shell Petroleum Corp. No. 4 Buehler, SW NE NW section 12-1n-1w, rig up. Max Conry and others No. 2 Barth, SE SW SE SW section 12-1n-1w, drilling at 600 feet. G. H. Blankenship and others No. 2 Roth, SW cor. NE SW SE section 12-1n-1w, rig up. George Anderson No. 1 Fowler, SW cor. NE SE section 12-1n-1w, rig. A. B. Ryan No. 1 Fortney, SE cor. section 12-1n-1w, Benoist sand at 1,355-67 feet, total depth, with 7-inch casing set at 1,366 feet. Group Oil Corp. No. 1 Beaver, SE cor. SW section 12-1n-1w, rigging up. Shell Petroleum Corp. No. 3 Pitchford, C NW NE SW section 1-1n-1w, rig up. Shell Petroleum Corp. and Gulf Oil Corp. No. 1 Criley-Buehler, SE SW NW section 1-1n-1w, drilling at 300 feet.

In Marion County, Tate & Longoria No. 1 Skipper, SW cor. SE NW section 6-1n-1e, coring at 1,381 feet. Hawley and others No. 1 Becker, NW cor. SW NW section 18-1n-1e, rigging up machine. Jack Darnell No. 1 Clark, near SW cor. section 7-1n-1e, rig up.

Richland County

In Richland County, Pure Oil Co. made a location for No. 1 Wade, C S half SE SW section 33-4n-9e. Pure Oil Co. made a location for No. 1 Colburn, 640 feet from W and 330 feet from S lines of section 33-4n-9e; No. 15 Coen, C E half NW SW section 4-3n-9e, location; No. 1 Pflaum, 340 feet from N and 660 feet from E lines of section 4-3n-9e, rig up; No. 4 Hundley, 760 feet from W and 1,025 feet from N lines of NE quarter section 5-3n-9e, drilling at 550 feet. Kingwood Oil Co. and others No. 1 Elliott, C N half SE NE section 28-4n-10e, was rigging up rotary. Pure Oil Co. No. 10 Palmer Taylor, C W half NW SE section 5-3n-9e, drilling at 2,737 feet; No. 3 Hundley, C E half SW NE section 5-3n-9e, drilling at 2,720 feet; No. 14 Coen, C W half NE SW section 4-3n-9e, pay at 2,940-47 feet and saturated Dolomite at 2,985-90 feet, swabbed 62 bbls. in eight hours and will acidize.

Miscellaneous Drilling

In Wayne County, Benedum & Trees No. 1 Gloyd, C E half SE section 32-2n-7e, set 10-inch casing at 185 feet.

In Clay County, Pure Oil Co. No. 1 T. H. Tetrick A, C N half SW SW section 4-2n-8e, had pay at 2,968-70 feet and 2,978-83 feet, total depth 3,043 feet, pumped 220 bbls. in 15 hours. The crew was testing.

In Washington County, Bitterman and others No. 1 Jesse, C SE NE section 16-3s-2w, was underreaming 5⅞-inch casing to 1,360 feet. Cypress sand at 1,222 feet filled the hole with water.

In Coles County, W. E. Hughes was shut down at 903 feet in No. 1 Swango, C SW NE section 27-13n-9e.

In Marion County, Dalton Oil Co. No. 1 Wesner, 75 feet from W and 150 feet from S lines of NW quarter section 24-2n-1e, machine on location. W. D. Shedden No. 1 Thomas Pawlica, SW NE SW section 23-2n-1e, drilling at 1,589 feet.

In Macon County, Warner Bros. No. 1 Peterson, NW NW SW section 3-15n-2e, was drilling at 712 feet.

In Fayette County, John Farrelly No. 1 Lilly, SE cor. SW SE section 16-8n-3e, was flowing about 20 bbls.

per day from sand at 1,495-1,522 feet. Five-inch casing will be run. W. V. Greer and others No. 1 Metzger, C N half NE NW section 19-5n-2e, will start drilling about April 15 after having set 10-inch casing at 20 feet. Carter Oil Co. No. 2 Dove, C E half SE NW section 15-8n-3e, was drilling at 866 feet, in shale.

In Edgar County, Sun Oil Co. was drilling at 380 feet in No. 1 Goodwin, C W half NE SE section 22-13n-12w.

In Jefferson County, H. J. Foltz No. 1 Carroll, NE NE SE section 16-2s-1e, had top of the Cypress sand at 1,845 feet, and was shut down at 1,853 feet. Carter Oil Co. No. 1 Copple, C E half SE SE section 9-1s-2e, had Bethel sand at 1,939-56 feet, saturated. Six-inch casing was set at 1,935 feet, will shoot sand; No. 1 Dobbs, C E half NE NW section 10-1s-2e, location; Carter Oil Co. No. 1 Hall, C E half NE SE section 4-1s-2e, location.

In Edwards County, Leach Bros. No. 1 Lee, SW NE SE section 11-1s-10e, was drilling at 3,142 feet.

In Bond County, Whitehead & Morey No. 1 Polland, NW SE SW section 26-6n-2w, was drilling at 3,020 feet.

In Effingham County, Kingwood Oil Co. and others No. 1 McWhorter, C E half SE NW section 15-6n-6e, was coring McClosky lime at 2,700 feet. Graham & Duncan were rigging up rotary for No. 1 Ricker, C N half SE NW section 18-6n-7e.

In Jasper County, Obermyer No. 1 Atkins, C N half NE section 3-6n-9e, was shut down at 1,260 feet.

OHIO

FINDLAY, Ohio, Mar. 28.—A 50-bbl. oil well in Washington County has aroused some interest in that particular area. In Grandview Township, McCall Drilling Co. No. 1 Curtis A. Price, section 21, topped the First Cow Run at 782 feet and found 100,000 feet of gas from 804-06 feet, and a good oil showing at 808-28 feet. It was shot with 20 quarts and bailed 50 bbls. the first day.

In Athens County, Rome Township, First National Bank No. 3 Arthur Finsterwald, section 12, was dry in the first Cow Run at 510-38 feet.

In Lorain County, Ridgeville Township, William Dempsey No. 2 Joseph H. Lyons, Lot 44, found the Clinton sand dry at 2,371-79 feet. Total depth was 2,440 feet.

In Meigs County, Lebanon Township, Proffitt and others No. 1 Carl Autherson, section 26, made 75,000 feet of gas from the Berea sand at 2,022-26 feet.

In Noble County, Olive Township, George Woodford No. 5 on the George Woodford tract, section 15, was drilled to 770 feet and abandoned. In Seneca Township, Mud Run Oil & Gas Co. No. 1 J. T. Watson, section 23, made 50,000 feet of gas from the Berea at 1,583-90 feet.

In Washington County, Newport Township, F. D. Kerr & Son No. 23 Ella West, section 35, is good for a 1-bbl. pumper from the Peaker sand at 742-55 feet.

Lima Field

In Seneca County, Pleasant Township, Herman Bosse No. 1 Chester Shaull, section 18, encountered the top of the Trenton at 1,508 feet. A small show of oil was found at 1,576 feet. Drilling is being continued.

In Putnam County, Blanchard Township, Brown Oil Co. No. 3 L. D. McCullough, section 23, was shot in the Trenton at 1,390 feet with 100 quarts, and has 300 feet of fluid in the hole. Pumping equipment is being installed.

SOUTHWESTERN INDIANA

PRINCETON, Ind., Mar. 28.—The only completion reported in the southwestern counties of Indiana in the past week was a dry hole in Posey County, Mickel & Watson No. 1 Cronbach, SW cor. SE SW SW section 15-8s-14w, abandoned at 1,485 feet. It had a showing of oil at 1,085 feet. George W. Miller and others were shut down at 1,697 feet in No. 1 Dr. Jordan, NE cor. NW section 15-4s-12w, in Posey County. Mickel & Douglas made a location for No. 1 Oakland City College, 200 feet from south and 330 feet from west lines of SE quarter section 16-8s-14w. Carter Oil Co. made a location for No. 1 Granlick, C E half NW NW section 4-7s-14w. Mickel & Nelson No. 1 Aldridge, SE cor. NE NE SW section 1-5s-13w, will run 5-inch casing to 2,241 feet, total depth.

In Daviess County, Ben D. Ruble No. 1 Brewer heirs, 250 feet from south and 350 feet from east lines SW SE section 33-3n-5w, was at 470 feet and 6⅝-inch casing will be lowered to the bottom. A. T. W. Spalding and others were moving in material to start No. 3 Beck, SE cor. SW SE section 8-2n-5w. W. F. Sowers made location for No. 1 Heldeman, 600 meet from north and 400 feet from E lines of section 35-2n-5w.

In Sullivan County, A. S. Reed and others No. 1 Springer, NW NE NE section 2-7n-10w, was drilling at 75 feet. Felmont Oil Corp. No. 1 Riggs, SW cor. SE NW section 36-8n-9w, had Mississippi lime top at 1,015 feet, and was drilling at 1,797 feet.

In Knox County, O. A. Thayer made a location for No. 1 Summers Estate, SW cor. NE NW NW section 12-5n-10w.

In Spencer County, Troy Refining Co. had rig up for No. 1 Anderson, NE SE SE NE section 11-6s-4w. F. A. Lorch made a location for No. 9 fee, SW cor. SE NW SW section 12-6s-4w.

In Perry County, Charles E. Dice made a location for No. 6 Peters, NW cor. section 11-5s-3w.

In Daviess County, A. T. Spalding and others were moving in material to start No. 3 Beck, SE cor. SW SE section 8-2n-5w.

WESTERN KENTUCKY

OWENSBORO, Ky., Mar. 28.—Flesher, Galey and others deep test in the Cloversport district of Breckinridge County, No. 4 Murray Tile Co., appears to be a commercial well. It is estimated all the way from 25 to 100 bbls. a day from Corniferous lime. Black shale was found at 1,450 to 1,568 feet and Corniferous limestone at 1,568 to 1,792 feet, the total depth. An oil showing at 1,632-44 feet was acidized with 1,500 gallons. The well was shut in for two days due to the swab being hung up in the hole. This is believed to have been the first well in Western Kentucky acidized in the Corniferous lime. The well had 90 per cent solubility and 0.28 per cent soluble iron and aluminum oxide.

In the Tar Springs district, Breckinridge County, William Rollins and others No. 1 Alco Brothers, deep test, was drilling at 500 feet on top of Bethel lime.

Butler County, Rochester district, J. C. Ellis and others No. 1 J. F. Hayes was rigging up.

Daviess County, Utica district, Daugherty & Ellis No. 2 William Huebner is a location. Berry School

(Continued on Page 217)

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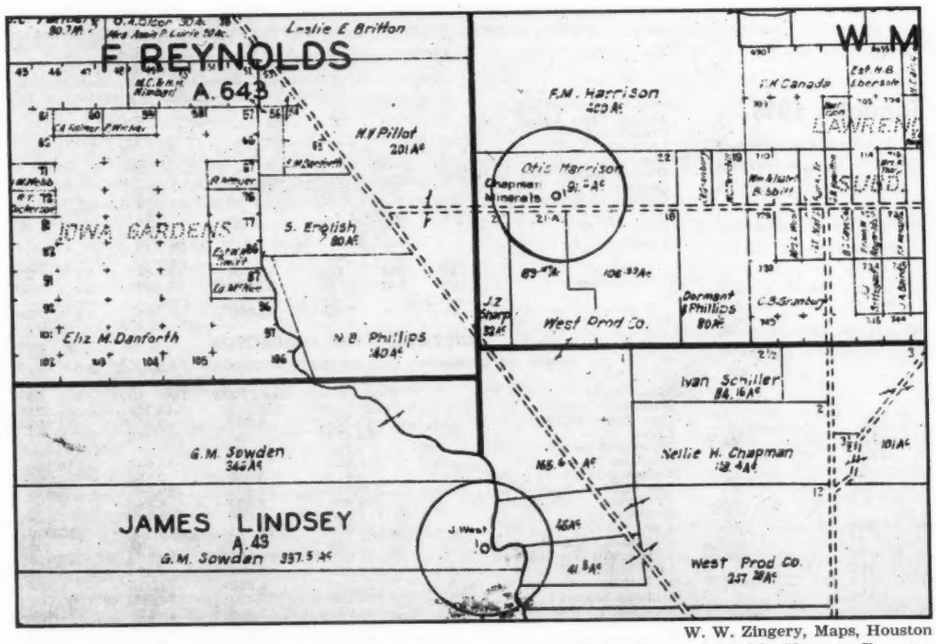
Texas and Louisiana Gulf

By
NEIL WILLIAMS

Three Pools Are Opened in South Texas and Louisiana

HOUSTON, Tex., Mar. 28.—The discovery of a new oil field in Jackson County, together with the completion of the first oil well in the Eureka Heights gas field, adjacent to the Houston city limits, and a half mile east extension to the Fairbanks field, Harris County, were the featured developments along the Texas Coast. In the Coastal Louisiana sector, a new oil field was opened on the University Prospect, in East Baton Rouge Parish.

Approximately 7 miles north of the town of Edna, Jackson County, H. J. Porter and others No. 1 Foust, in the Peter White Survey, opened a shallow field when it was completed for an initial production of 177 bbls. per day through a ¼-inch choke with tubing pressure 225 pounds and casing pressure 330 pounds. Production is from the Miocene sand through perforated casing at 2,652-57 feet. The well is located on a geophysical prospect and was drilled on farmed-out acreage of the Gulf Oil Corp. Protection acreage is held by various major companies and an early development is anticipated provided the well continues to flow steadily. This is the first Miocene production developed in this area for sometime and it is expected to encourage wildcatting throughout the county.



W. W. Zingery, Maps, Houston

Two important wildcats now drilling northeast of the Friendswood field, Harris County, which have attracted wide attention

Houston's Home Field

Jack Frazier and others No. 1 Vollmer-Nieman, approximately 2,500 feet west of the Houston city limits and about 1,100 feet southeast of distillate production of the Eureka Heights gas field, Harris County, was completed Thursday, March 24, for an initial production of 25 bbls. of pipe line oil per hour through a ¼-inch choke with tubing pressure 825 pounds and casing pressure 1,000 pounds. Production is from the Upper Saline Bayou formation through perforated casing at 7,697-7,722 feet. Derrick is up for the same operator's No. 1 Varner Realty Co., about 850 feet southwest and the rig from the discovery well is being moved in. Production was established on this structure after six wells had been drilled, two of which were wet gas wells and others dry holes. The structure is fairly well defined to the south, east and north and it is doubtful if production will extend over a wide area.

In the same county and a half mile east of production of the Fairbanks field, Amerada Petroleum Corp. and Stanolind Oil & Gas Co. No. 1 White, perforated casing at 6,842-55 feet, and is flowing an estimated 20 bbls. of pipe line oil per hour through a ¼-inch choke. Midway between this well and the discovery well locations were made by Amerada Petroleum Co. and Stanolind Oil & Gas Co. for No. 1 Day and No. 1 Silverburg in Lots 7 and 6 respectively, offsetting E. L. Smith and Ownby Drilling Co. No. 1 Mills, a recent producer. In the same area, Smith and Ownby have spudded No. 2 L. M. Meyers, 466 feet east of No. 1 Smith. H. E. Williams and others No. 1 A. Vaja, 1½ miles southeast of the discovery well, perforated casing at 6,822-34½ feet and it tested salt water on a production test. The perforations have been squeezed off and a second test was scheduled to be made. It is expected that the well will make a wet gasser which, if true, will curtail drilling activity in this part of the field to some extent.

Matagorda County

In Matagorda County, approximately 4,500 feet southwest of the McCrosky discovery well, Superior Drilling Co. No. 1 Paul Kruger, attempted a drill stem test in a sidetracked hole at 6,685-96 feet, but the seat slipped and the hole was cored to 6,698-6,704 feet where a 3-minute drill stem test recovered 420 feet of fluid. The first 180 feet was drilling mud, the next 30 feet was salt water and the bottom 210 feet was drilling mud, cut with gas. Late in the week, the operators were attempting to make a second test. In the adjoining county and northwest of Port O'Connor, Calhoun County, Salt Dome Oil Co. and Gulf Board Oil Co. have derrick up for No. 1 P. R. Austin in the Santiago Gonzales Survey. This hole is being started with a core rig. Salt Dome Oil Corp. has been engaged in geophysical work in this area for sometime.

Wildcatting in the Pearland area, Brazoria County, was given a set-back with the abandonment of two tests. Albert Plummer No. 1 Street, D. H. M. Hunter Survey, quit at 6,355 feet, while Christi & Dunman No. 1 J. J. Settegas, 1½ miles southeast was abandoned at 6,543 feet. Both wells were drilled as mysteries, and no geological tops were available.

In the Cedar Bayou field, Chambers County, Merit Oil Co. and others are starting a third test. It is on the Milam estate, Christian Smith Survey, just across the county line in Harris County. In the Cedar Point field, Galveston Bay, Humble Oil & Refining Co. has spudded No. 1 State, offsetting the discovery well, while Standard Oil Co. of Texas and Salt Dome Oil Co. are rigging up their second test.

Coastal Louisiana

In Coastal Louisiana and adjoining the Louisiana State University campus, East Baton Rouge Parish, Austin B. Taylor (Texas Crusader Oil Co.) completed No. 1 Duplantier for an initial production of 465 bbls. of 33.2-gravity oil per day. The flow was through a ⅞-inch choke, with the tubing pressure 1,000 pounds. The hole is believed to be bottomed in the Marginulina formation at 6,477 feet, and the well was completed after cementing 7-inch casing at 6,472 feet. The well is located in section 65-7s-1w in an area known as the University prospect on which two previous dry holes had been drilled.

The most closely watched wildcat prospect is the Little Chenier area in Cameron Parish where Humble Oil & Refining Co. is drilling below 8,835 feet in No. 1-B Miami Corp. Reports of favorable showings below 8,600 feet have skyrocketed royalty prices to $200 per acre base and several trades are reported to have been made. Added attention was given the area with the announcement of a second wildcat location which was made by Ash Robinson on the Nunez 32-acre tract in the southeast quarter of section 19-14s-6w. The location is approximately 1¼ miles south of Humble Oil & Refining Co. No. 1-B Miami, located in section 7-14s-6w.

Preparations are being made by Superior Oil Co. and Pure Oil Co. for an extensive development of its recently opened oil field in the Gulf of Mexico, approximately 1 mile offshore from Cameron Parish. A 40-acre tract has been purchased for an operating camp and tank site and a 3-inch pipe line will be laid to the producer and extending to the Intracoastal Canal.

Villa Platte Field

Two wells were scheduled to be completed in the Villa Platte field, Evangeline Parish, by Continental Oil Co. No. 1 Hirsch is bottomed at 9,040 feet and casing is being cemented. The Cook Mountain formation was topped at 7,820 feet. No. 1 Pierre McDaniels topped the Sparta at 8,580 feet and is coring below 9,000 feet. No. 1 Tate topped the Cook Mountain at 7,957 feet and the Sparta at 8,582 feet. The latter two wells are checking slightly lower than No. 1 Tate, the discovery well in section 44-3s-2e.

In the Abbeville field, Vermilion Parish, Continental Oil Co. abandoned No. 1 Faulk, at a total depth of 9,000 feet. The Brookshire sand, the discovery horizon, was topped at 8,040 feet or approximately 200 feet low. The well is northeast of the discovery in section 66-12s-3e.

COMPLETIONS ON TEXAS COAST

Brazoria County

Danbury field: Rowan Drilling Co. and others No. 4 Jameson, 2,166 feet, abandoned. Hastings field: Humble Oil & Refining Co. No. 11 R. D. Haden, sand 6,011-80

feet, 548 bbls., ¼-inch choke; No. 7 W. H. Schindler, oil sand 5,902-6,080 feet, 583 bbls., ¼-inch choke. Navarro Oil Co.-Humble Oil & Refining Co. No. 3-A W. F. Beers, sand 6,098-6,105 feet, 285 bbls., ⅞-inch choke. Stanolind Oil & Gas Co. No. 18 Drake, 5,835 feet, perforated casing 5,732-94 feet, 567 bbls., ¼-inch choke; No. 2 Stockwell, 6,080 feet, perforated casing 6,036-76 feet, 629 bbls., ¼-inch choke. Manvel field: Texas Co. No. 4 Morrison, 5,680 feet, 558 bbls., ¼-inch choke.

Chambers County

Anahuac field: Humble Oil & Refining Co. No. 23 Tyrell, sand 7,005-85 feet, 681 bbls., ¼-inch choke. Seabreeze field: Sun Oil Co. No. 1 Seabreeze Land Co., 8,889 feet, perforated casing 8,850-60 feet, 2,775,000 feet of gas, 10/64-inch choke.

Fort Bend County

Thompson field: Gulf Oil Co.-Humble Oil & Refining Co. No. 28-X Lockwood Sharpe, 3,147 feet, 397 bbls., quarter-inch choke.

Galveston County

Dickinson field: Atlantic Refining Co. No. 2 M. H. and W. G. Jones, 8,137 feet, perforated casing 8,126-31 feet, 441 bbls., ¼-inch choke. F. W. Bennett No. 4 B. C. Schroeder, 8,120 feet, perforated casing 8,098-8,116 feet, 535 bbls., ¼-inch choke. Humble Oil & Refining Co. No. 1 L. V. Overton, 8,867 feet, 732 bbls., ¼-inch choke. Hitchcock field: Red Bank Oil Co. No. 1 Maco Stewart, 6,611 feet, abandoned.

Harris County

Friendswood field: Humble Oil & Refining Co. No. 6 E. A. Grey, sand 5,895-6,041 feet, 584 bbls., ¼-inch choke; No. 1 W. H. Moore, sand 5,916-6,043 feet, 552 bbls., ¼-choke. Tomball field: Humble Oil & Refining Co. No. 1 Kuehn, 5,560 feet, perforated casing 5,546-49 feet, 240 bbls., ¼-inch choke. Amerada Petroleum Co. and others No. 1-A H. M. Bell, 5,593 feet, perforated casing 5,582-89½ feet, 19 bbls. per hour, ¼-inch choke.

Hardin County

Silsbee field: Republic Production Co.-Houston Oil Co. No. 28 Brooks, 6,975 feet, 481 bbls., ¼-inch choke.

Jefferson County

Amelia field: Stanolind Oil & Gas Co. No. 2 Keith Dowlen, 7,729 feet, perforated casing 5,371-92 feet, 130 bbls., pumping. Fannett field: Gulf Oil Corp. No. 1 Spencer-Junker, 7,293 feet, abandoned.

Liberty County

Hankamer field: Gulf Oil Corp. No. 27 E. W. Boyt, 2,946 feet, 283 bbls., ¼-inch choke. Hardin field: Humble Oil & Refining Co. No. 1 W. McMurtry, 7,569 feet, 451 bbls., ¼-inch choke. Halliburton Oil Producing Co. No. 1 B. F. Hanchey, 7,622 feet, 605 bbls., ¼-inch choke.

Orange County

Orange field: J. M. Campbell No. 1 Scales, 5,989 feet, abandoned. Port Neches field: Texas Co. No. 5-A Polk, 6,508 feet, abandoned.

Tyler County

Spurger field: Republic Production Co.-Houston Oil Co. No. 8 Hurd, sand 7,610-84 feet, 520 bbls., ¼-inch choke.

Matagorda County

Van Vleck field: Skelly Oil Co. No. 3 Grace Moore, 7,495 feet, perforated casing 7,487-91 feet, 544 bbls., ¼-inch choke; No. 2 First National Bank, 8,200 feet, perforated casing 8,233-37 feet, 339 bbls., ⅞-inch choke.

Wharton County

Withers field: Texas Co. No. 45-C Pierce Estate, 5,550 feet, 293 bbls., 12/64-inch choke.

N. Y.-Penn. Gas Fields

(Continued from Page 200)

in material on the Flora Rooks farm, Harrison Township.

In two wildcat tests, McKenry and others are shut down after fishing out tools lost at 4,429 feet on the Stellman farm, Rockland Township, Venango County, and Evjen and others are shut down at 4,553 feet on the Dusenberry farm, Watson Township, Warren County.

New York Operations

Additional footage was recorded in 7 of the 13 tests now drilling in New York state during the past week. Most of this activity is in the Woodhull Township field of Steuben County. Status of these operations follow:

New York State Natural Gas Co., 3,660 feet on the Lyle Wheatcraft farm; G. L. Cabot, Inc., 715 feet on the C. Groves No. 2 farm; G. L. Cabot, Inc., 560 feet on the Neva Husted farm; Sylvania Corp., reaming, 614 feet, H. Hand No. 2 farm; New York State Natural Gas Co., 774 feet, Park Estate farm; New Penn Development Corp., 596 feet, M. K. Husted farm, and Clancy and others, rig up on the R. Towsley farm.

New York State Natural Gas Co. is also drilling at 2,920 feet in its wildcat on the S. H. English farm in Van Etten Township, Chemung County. Empire Producing Co. has spudded in on the Dan Clark farm, elevation 2,199 feet, in Willing Township, Allegany County. John Becker has the rig up for a test on the Riley Brothers farm, another Willing Township, Allegany County, test.

California Oil Field Operations for January, 1938

According to figures collected by the American Petroleum Institute, the total production of crude oil in California for January amounted to 22,008,235 bbls., an average of 709,943 bbls. per day. This is an increase of 4,973 bbls. per day over December production.

Total stocks of crude and all products in Pacific Coast territory increased during the month 4,643,506 bbls. The total stocks at the end of the month were 132,683,753 bbls. The December 31, 1937, stock figures appearing herein differ from those reported in the December summary, due to reclassification of stocks, effective January 1, 1938.

One hundred nineteen wells were completed during the month with an initial daily production of 85,446 bbls., compared with 81 wells completed during December with an initial production of 33,406 bbls.

OIL FIELD DEVELOPMENT

	New rigs up	Active drilling	Producers completed	Daily initial output	Active producing	Abandoned Drillers	Abandoned Producers
Group No. 1:							
Belridge—North	1	8	2	1,735	54	...	...
Belridge—South	...	...	...	...	126	...	...
Canal	...	2	...	...	1	...	...
Canfield Ranch	...	...	1	750	1	...	...
Coalinga	1	4	...	...	905	...	...
Edison	1	1	...	...	89	...	...
Elk Hills	...	1	1	55	170	...	2
Fruitvale	3	2	2	693	162	...	...
Greeley	1	6	2	700	12	2	...
Kern River	...	2	3	190	1,350	4	...
Kettleman Middle Dome	...	1	...	...	3	...	...
Kettleman North Dome	6	12	4	5,949	186	...	...
Lost Hills	2	3	...	...	201	1	1
McKittrick	...	1	...	...	216	...	...
Midway-Sunset	5	9	6	585	2,535	7	5
Mountain View	...	1	1	219	194	1	...
Mount Poso	6	4	...	...	275	...	...
Rio Bravo	2	7	...	...	1	...	...
Round Mountain	3	4	10	2,832	173	3	...
Ten Section	3	4	2	5,640	10	...	...
Wheeler Ridge	...	...	...	...	23	...	...
Group No. 2:							
Capitan	...	...	...	...	42	...	...
Elwood	...	...	...	...	83	...	...
Rincon	1	2	...	...	35	...	...
San Miguelito	...	1	...	...	15	...	...
Santa Barbara	...	...	...	...	36	...	...
Santa Maria	20	22	18	15,401	302	2	...
Summerland	...	...	...	...	19	...	...
Ventura Avenue	1	7	2	5,277	249	...	...
Ventura-Newhall	1	10	4	294	582	1	...
Watsonville	...	...	...	...	7	...	...
Group No. 3:							
Brea-Olinda	1	2	1	32	348	...	1
Coyote—East	1	...	...	...	83	...	...
Coyote—West	1	...	1	200	31	...	...
Dominguez	2	4	4	854	171	...	...
El Segundo	1	7	8	3,139	58	1	...
Huntington Beach	...	1	1	65	565	...	3
Inglewood	...	1	...	...	194	...	...
Lawndale	...	...	...	...	6	...	...
Long Beach	7	7	5	961	1,240	1	3
Los Angeles-Salt Lake	...	...	...	...	113	...	...
Montebello	2	2	1	732	210	...	...
Playa Del Rey	...	...	...	...	200	...	1
Potrero	...	...	...	...	11	...	...
Richfield	1	6	3	900	293	1	...
Rosecrans	2	4	...	...	84	...	...
Santa Fe Springs	...	1	1	82	662	...	3
Seal Beach	...	1	...	...	114	...	...
Torrance	2	4	...	...	522	...	...
Whittier	...	...	...	...	135	...	...
Wilmington	40	26	36	38,161	383	...	1
Miscellaneous drilling	9	49	...	...	...	11	...
Group No. 4, gas fields:							
Buena Vista Lake	...	1	...	...	5	...	...
Buttonwillow	...	...	...	...	16	...	...
Chowchilla	...	...	...	...	...	...	...
Delano	...	...	...	...	1	...	...
Dudley Ridge	...	...	...	...	...	...	...
Goleta	...	...	...	...	1	...	...
McDonald Island	...	1	...	...	4	...	...
Rio Vista	1	1	...	...	11	...	...
Semi-Tropic	...	1	...	...	20	...	...
Tracy	...	...	...	...	6	...	...
January	127	233	119	85,446	13,544	35	20
December	101	263	81	33,406	13,463	22	40
Increase (*decrease)	26	*30	38	52,040	81	13	*20

CRUDE PETROLEUM PRODUCTION

(Figures of production and stocks are in barrels of 42 gals.)

	Total production	Daily average Jan., 1938	Daily average Dec., 1937	Daily average Jan., 1937
Group No. 1:				
Belridge—North	483,012	15,581	16,151	15,121
Belridge—South	48,103	1,552	1,553	1,894
Canal	14,414	465	467	...
*Canfield Ranch	715	20	...	...
Coalinga	461,627	14,891	15,047	16,183
Edison	113,413	3,659	3,782	4,993
Elk Hills	339,016	10,936	10,962	8,486
Fruitvale	298,806	9,639	8,685	8,485
Greeley	114,089	3,680	3,772	448
Kern River	457,947	14,772	15,323	15,056
Kettleman Middle Dome	2,529	83	88	206
Kettleman North Dome	2,521,918	81,352	82,173	77,470
Lost Hills	112,738	3,638	3,679	3,837
McKittrick	131,816	4,252	4,359	1,586
Midway-Sunset	2,340,266	75,492	74,266	65,762
Mountain View	433,010	13,968	15,525	21,482
Mount Poso	631,900	20,384	20,923	17,980
Rio Bravo	80,037	2,582	2,559	...
Round Mountain	564,220	18,201	17,168	11,815
Ten Section	120,492	3,887	3,662	1,015
Wheeler Ridge	9,711	313	310	325
Group No. 2:				
Capitan	95,932	3,095	3,017	1,836
Elwood	237,578	7,664	7,648	9,705
Rincon	98,879	3,189	3,069	2,105
San Miguelito	126,013	4,065	3,690	2,209
Santa Barbara	16,207	523	567	752
Santa Maria	491,347	15,850	13,862	4,766
Summerland	992	32	31	37
Ventura Avenue	1,126,450	36,337	35,679	33,885
Ventura-Newhall	163,576	5,277	4,959	4,955
Watsonville	1,860	60	60	60
Group No. 3:				
Brea-Olinda	190,681	6,151	6,132	8,171
Coyote—East	125,649	4,053	4,094	3,051
Coyote—West	293,415	9,465	9,252	7,641
Dominguez	935,937	30,192	29,686	24,436
El Segundo	602,955	19,450	19,951	2,130
Huntington Beach	1,069,843	34,511	35,403	34,933
Inglewood	497,434	16,046	16,248	12,827
Lawndale	3,010	97	89	84
Long Beach	1,768,254	57,040	58,181	62,139
Los Angeles-Salt Lake	17,836	575	568	808
Montebello	254,983	8,225	7,237	8,964
Playa Del Rey	226,645	7,311	7,608	10,308
Potrero	11,804	381	536	276
Richfield	302,891	9,771	10,066	7,343
Rosecrans	172,279	5,558	5,593	2,254
Santa Fe Springs	1,260,635	40,666	41,011	43,588
Seal Beach	295,805	9,542	9,277	9,503
Torrance	238,824	7,704	7,616	8,142
Whittier	27,779	896	917	907
Wilmington	2,072,963	66,870	62,469	1,707
Total	22,008,235	709,943	704,970	581,666
December	21,854,057	704,970		
Increase	154,178	4,973		

*Situated approximately 12 miles southwest of Bakersfield, in Kern County.

Rocky Mountain Area

By
T. R. INGRAM

Cut Bank Gets New Outlet; Test in Sioux County, Neb.

DENVER, Colo., Mar. 28.—There were no completions or new operations reported in Colorado.

Three new wells are getting under way in Carbon County, Wyoming, one to be a test of the Tensleep at Allen Lake, another a wildcat on Oil Springs, and the third, an outpost well at Big Medicine Bow. One new location was released on the west side of Lance Creek, an offset to the Price well, by A. B. Cobb.

Interests allied with the Wasatch Oil Refining Co. of Salt Lake City announced plans for construction of a refinery at Spokane, Wash., to run on Cut Bank, Montana, crude.

The Union Oil Co. of California released a location for an important 6,500-foot test in Sioux County, Nebraska.

NEW MEXICO

An effort to extend the Vacuum area in Lea County 3½ miles southeast is to be made at Continental Oil Co. No. 1-I-16 State, C NW NE section 16-18-35, newest southeastern New Mexico wildcat. Derrick was being erected. Shell Petroleum Corp. and Humble Oil & Refining Co. are contributing to the test.

George F. Getty, Inc., No. 1 Riggs, NW cor. section 1-26-37, was proven a pool opener in extreme southeastern Lea County, more than 2 miles southeast of nearest production in the Jal sand pool. It flowed about 35 bbls. of oil through casing in four and one-half hours after a shot. The crew was cleaning out for further testing. Pay was topped at 3,235 feet, total depth 3,358 feet, plugged back to 3,346 feet.

Completions of the week in Lea County included a Hobbs pool extensioner at J. P. Cusack, Inc., No. 1 Turner, SW NE SE section 34-18-38, on the east side of the field, one-fourth mile from production. It had porous lime at 4,212-41 feet, total depth, was acidized and flowed 748 bbls. of oil daily through tubing, with 212 bbls. of sulfur water. Gas gauged 1,000,000 feet. Before acidizing, production was estimated at only 3 bbls. daily.

A large natural producer was completed in the northeast extension of the Cooper pool at Kan-Mex Corp. No. 2-B-3 Vaughn, NW cor. section 3-24-36. It flowed 2,688 bbls. of oil daily through tubing from lime pay topped at 3,620 feet, total depth 3,638 feet.

A failure was completed about one-half mile northwest of the Cooper producer at Shell Petroleum Corp. No. 1 Whitten, NE SW SE section 33-23-36. Sulfur water intruded, and it was dry and abandoned at 3,810 feet.

Phillips Petroleum Co. and Pure Oil Co. No. 1 Woolworth, C SE NE section 33-24-37, west outpost in the Jal sand area, flowed 194 bbls. of oil naturally through choke in five hours and was completed for 891 bbls. of oil daily. Pay was topped at 3,450 feet, total depth 3,538 feet.

Gulf Oil Corp. No. 1 Woolworth, C NE SE section 30-24-37, an old well, was deepened from 3,217 feet to 3,803 feet, plugged back to 3,773 feet and recompleted for 3,500,000 feet of gas daily.

Other Lea County completions: Continental Oil Co. No. 8-A-14 Sanderson, NE NW SE section 14-20-36, topped pay at 3,810 feet, total depth 3,862 feet, and flowed 432 bbls. of oil daily through choke.

Gulf Oil Corp. No. 3 Day, SE SE SW section 6-22-36, was acidized and flowed at the rate of 529 bbls. of oil daily through tubing from pay found at 3,775 feet, total depth 3,835 feet.

Same operator's No. 3 McCormack, C SE SE section 32-21-37, had pay at 3,710 feet, was bottomed at 3,762 feet and flowed 30 bbls. of oil naturally through choke in 18 hours. After acidizing, it flowed 60 bbls. of oil through choke in 24 hours. Gravity of the oil was 39 degrees.

Shell Petroleum Corp. No. 1-A State, C NW SE section 16-23-36, topped pay at 3,565 feet and was completed at 3,700 feet, total depth. It flowed 90 bbls. of oil daily through choke, with 210 bbls. of sulfur water.

Sun Oil Co. No. 4 Stuart, C SE NE section 15-25-37, had pay at 3,252 feet, total depth 3,364 feet in lime and sand, and flowed 63 bbls. of oil naturally through casing. It was shot and flowed 205 bbls. of oil daily through casing.

Western Gas Co. No. 1 Davis, C SW SE section 33-23-37, had pay at 3,500 feet, total depth 3,601 feet. It flowed 15 bbls. of oil naturally through casing. After a shot it flowed 160 bbls. of oil in 19 hours through choke, with gas gauging 2,000,000 feet. It flowed 240 bbls. of oil in 24 hours through tubing.

One completion was reported in Eddy County at Grayburg Oil Corp. No. 4 Keely, SE SW NE section 24-17-29. It found pay at 2,880 feet, was bottomed at 3,588 feet, plugged back to 3,200 feet, was acidized and flowed 100 bbls. of oil in 24 hours.

Lea County

Amerada Pet. Corp. No. 6 Byrd, SE sec. 12-20-36. Loc.
Amerada Pet. Corp. No. 3 Laughlin, C NW NE sec. 9-20-37. T.D. 2,855 ft.; set 8-in. 2,573 ft.
Amerada Pet. Corp. No. 1 State VA, C SE SW sec. 23-17-34. Drlg. 4,201 ft.
Amerada Pet. Corp. No. 1 State VB, C NE SW sec. 36-17-34. T.D. 1,532 ft.; set 7⅝-in. 1,513 ft.
Anderson-Prichard Oil Corp. No. 1 Carlson, C SW NW sec. 21-25-37. O.W.D.D.; T.D. 3,020 ft.; flwd. 40 B.O. P.D.; rng. tbg.
Anderson-Prichard Oil Corp. No. 2 Jal, C NW NE sec. 8-25-37. T.D. 3,479 ft.; flwd. 122 B.O. in 6 hrs.; tstg.
Anderson-Prichard Oil Corp. No. 1 Wells, C SE SE sec. 5-27-37. Drlg. 3,610 ft.
Anderson-Prichard Oil Corp. No. 2 Langlie, SE sec. 8-25-37. Drlg. 3,420 ft.
Bradley Oil Co. No. 1 Downes, SE NE SE sec. 5-22-37. Drlg. 2,850 ft.
Cities Service Oil Co. No. 3-A Closson-A, C NE SE sec. 18-22-36. Drlg. 1,285 ft.
Cities Service Oil Co. No. 1-H State, C NE NE sec. 17-22-36. T.D. 3,884 ft.; prep. to deepen.
Continental Oil Co. No. 3-B-6 Elliott, C SE SE sec. 6-22-37. T.D. 3,778 ft.; rng. tbg.
Continental Oil Co. No. 1-A-31 Marsh, SE sec. 31-20-39. Wildcat; T.D. 4,346 ft.; drlg. out bridge.
Continental Oil Co. No. 3-B-23 Reed, C E½ SE SE sec. 23-20-36. Drlg. 3,200 ft.
Continental Oil Co. No. 4-B-24 Reed, CEL NW SW sec. 24-20-36. Drlg. 3,237 ft.
Continental Oil Co. No. 1-F-1 State, C SW SW sec. 1-21-36. T.D. 3,847 ft.; shot; 1,947,000 ft. gas; bailing.
Continental Oil Co. No. 1-G-12 State, C SE SW sec. 12-18-35. Drlg. 3,320 ft.
Continental Oil Co. No. 1-H-35 State, C SE NE sec. 35-17-34. Drlg. 3,340 ft.
Continental Oil Co. No. 1-I-16 State, C NW NW sec. 16-18-35. Cellar.
Cranfill & Germany No. 1 Weir, C NE NE sec. 15-20-37. T.D. 4,210 ft.; S.D.O
Culbertson & Irwin No. 3 Alston, NE cor. sec. 27-25-37. Drk.
Culbertson & Irwin No. 16-A Humphrey, NE SW SE sec. 3-25-37. Drlg. 60 ft.
Culbertson & Irwin No. 1 Liberty Royalty, NW sec. 3-25-37. T.D. 3,396 ft.; jarring on tools.
Danglade & Clower No. 1 Currie, NE NE SW sec. 6-21-37. Drlg. 2,653 ft.
Danglade & Clower No. 1 Glier, C SW NE sec. 32-22-37. T.D. 3,680 ft.; acd.; tstg.
L. E. Elliott No. 2 Elliott, NE NW SE sec. 26-20-36. Drlg. 1,210 ft.
A. R. Eppenauer No. 1 Stuart, NW NE NE sec. 22-25-37. T.D. 2,900 ft.; to drill plug.
J. E. Farrell No. 2-C Walden, C SE SW sec. 15-22-37. Drlg. 3,700 ft.
Geo. F. Getty, Inc., No. 2-F State, C NW NE sec. 36-17-34. Drlg. 1,940 ft.
Geo. F. Getty, Inc., No. 1 Riggs, NW sec. 1-26-36. Wildcat; T.D. 3,358 ft.; P.B. 3,346 ft.; flwd. 35 B.O.P.D.; C.O.
Gulf Oil Corp. No. 1 Alley, C NE SE sec. 10-23-37. Drlg. 2,585 ft.
Gulf Oil Corp. No. 7-F Bell, C SW NW sec. 36-20-36. Drlg. 1,460 ft.
Gulf Oil Corp. No. 1 Boyd, sec. 23-22-37. T.D. 3,681 ft.; tstg.
Gulf Oil Corp. No. 1 Elliott, SW SE SE sec. 15-25-37. Drlg. 3,420 ft.
Gulf Oil Corp. No. 2-D Kutter, C SE SW sec. 8-19-37. T.D. 4,040 ft.; tstg.
Gulf Oil Corp. No. 4-C Kutter, C SW NW sec. 18-19-37. Drk.
Gulf Oil Corp. No. 1-D Mattern, SW sec. 6-22-37. T.D. 3,795 ft.; P.B. 3,775 ft.; C.O.
Gulf Oil Corp. No. 4 McCormack, C SW SE sec. 32-21-37 Drlg. 500 ft.
Gulf Oil Corp. No. 1 LeMunyon, C NE NE sec. 28-23-37. Old well; T.D. 3,666 ft.; S.I.
Gulf Oil Corp. No. 2 Ramsey, C SW SW sec. 27-21-36. T.D. 3,895 ft.; S.D.O.
Gulf Oil Corp. No. 1 J. Whitten, SE SE SW sec. 33-23-36. T.D. 1,580 ft.; set 8⅝-in. 1,577 ft.
Humble O. & R. Co. No. 4 Fopeano, C SE SE sec. 26-20-36. T.D. 3,850 ft.; tstg.
Humble O. & R. Co. No. 2 Greenwood, C NE SW sec. 9-22-37. T.D. 3,714 ft.; tstg.
Humble O. & R. Co. No. 2-H State, C SE SW sec. 27-22-37. Drlg. 3,568 ft.
Humble O. & R. Co. No. 3 Williams, C SW NW sec. 34-24-37. T.D. 3,532 ft.
Inter-Coast Pet. Co. and J. C. Clower No. 1 State, SW cor. sec. 2-23-37. Drlg. 1,730 ft.
Jal Nat. Gas Corp. No. 2 Justis, NE sec. 20-25-37. T.D. 3,029 ft.; tstg.
Carl B. King No. 1-A Stuart, NW NE NW sec. 14-25-37. T.D. 3,395 ft.; tstg.
Magnolia Pet. Co. No. 1 Brunson-Argo, C NW NE sec. 9-22-37. T.D. 1,396 ft.; set 9⅝-in. csg.
Magnolia Pet. Co. No. 1 State G, NW NW NE sec. 34-17-34. T.D. 4,905 ft.; P.B. 4,794 ft.
Magnolia Pet. Co. No. 1-J State, C NE SE sec. 22-17-34. T.D. 4,207 ft.; set 7-in. csg.
Magnolia Pet. Co. No. 1-K State, C NW SE sec. 31-17-35. Drlg. 4,090 ft.
Magnolia Pet. Co. No. 2 State-Bridges, sec. 14-17-34. T.D. 4,593 ft.; flwd. 51 B.O. in 1 hr., naturally.
Magnolia Pet. Co. No. 3 State-Bridges, C NE NW sec. 26-17-34. Drlg. 2,115 ft.
Magnolia Pet. Co. No. 4 State-Bridges, C NW NE sec. 26-17-34. Drlg. 3,407 ft.
Magnolia Pet. Co. No. 5 State-Bridges, C NE NW sec. 26-17-34. Drlg. 3,504 ft.
J. A. Mascho No. 1 Cloyd, C SE SE sec. 20-22-23. Wildcat; T.D. 3,516 ft.; drlg. by.
C. T. McLaughlin No. 1 Polhamus, NE sec. 9-24-37. T.D. 3,672 ft.; S.D.O.
National Drlg. & Prod. Co. No. 1 Flint, C NE NE sec. 29-20-34. Wildcat; drlg. 3,695 ft.
Ohio Oil Co. No. 1 Kutter D, C SW SW sec. 18-19-37. Drlg. 3,590 ft.
Ohio Oil Co. No. 7 State-McDonald, C SW SE sec. 16-22-36. T.D. 3,871 ft.; C.O.
Ohio Oil Co. No. 10 State-McDonald, C NE SW sec. 16-22-36. Drlg. 37 ft.
Ohio Oil Co. No. 1 State-Staplin, C SE SW sec. 30-17-35. Drlg. 3,690 ft.
Parker Drlg. Co. No. 1 Irwin, C W½ SW SW sec. 35-24-37. T.D. 3,369 ft.; jarring on tools.
Lem Peters No. 1 May, C NW SE sec. 27-22-37. Cellar and pits.
Phillips Pet. Co. No. 2 New, CEL SE NE sec. 26-20-36. Drlg. 2,985 ft.
Phillips Pet. Co. No. 2 Santa Fe, C SW SE sec. 30-17-35. Drlg. 4,276 ft.
Phillips Pet. Co. No. 1 Santa Fe, C SW NW sec. 31-17-35. T.D. 4,650 ft.
Plains Prod. Co. No. 1 Humphreys, NE sec. 3-25-37. Loc.
Repollo Oil Co. No. 4 Moseley, SW SE NE sec. 34-24-37. Drlg. 2,810 ft.
Repollo Oil Co. No. 1 State, SE cor. sec. 6-17-34. Drlg. 1,840 ft.
Repollo Oil Co. No. 3-C Stuart, SE NE SW sec. 20-25-27. O.W.D.D.; T.D. 3,395 ft.; tstg.
Repollo Oil Co. No. 3-B Whitten, NE SE NE sec. 4-24-36. Drlg. 1,140 ft.
Shasta Oil Co. No. 2 Woolworth, NE NW NW sec. 28-24-37. Drlg. 2,915 ft.
Shell Pet. Corp. No. 1-A State, NE cor. sec. 33-18-36. Drlg. 3,830 ft.
Shell Pet. Corp. No. 1-A State, C NW NE sec. 31-17-35. Drlg. 3,460 ft.
Shell Pet. Corp. No. 2-A State, C SW NE sec. 31-17-35. R.U.R.
Shell Pet. Corp. No. 4-E State, C SW NW sec. 12-20-36. Drlg. 3,800 ft.
Sindorf et al No. 1 Glier, NE cor. sec. 33-22-27. T.D. 3,679 ft.; tstg.
Skelly Oil Co. No. 5 J. B. Baker, C SE NW sec. 27-22-37. T.D. 3,620 ft.; tstg.
Skelly Oil Co. No. 2 Hill, C NW NE sec. 6-21-37. Drlg. 3,740 ft.
Skelly Oil Co. No. 3 G. W. Sims, C NW NE sec. 9-23-37. T.D. 3,642 ft.; C.O.
Skelly Oil Co. No. 1-C R. R. Sims, sec. 3-23-37. Drlg. 3,688 ft.
Skelly Oil Co. No. 1-E W. P. Sims, C NW NE sec. 10-23-37. T.D. 3,625 ft.; flwd. 452 bbls. in 24 hrs.
Skelly Oil Co. No. 1-K State, NE NE NW sec. 32-21-37. Drlg. 3,611 ft.
Skelly Oil Co. No. 1 Toby, C SW SW sec. 7-24-37. Cg. 3,636 ft.
Stanolind O. & G. Co. No. 14-A Gilluly, C SW NW sec. 24-20-36. Drlg. 1,508 ft.
Stanolind O. & G. Co. No. 2-A Hill, C NE SE sec. 6-21-37. Loc.
Stanolind O. & G. Co. No. 2-C Hill, C SW NW sec. 5-21-37. T.D. 3,753 ft.; fag.
Stanolind O. & G. Co. No. 3-C Hill, C NW NW sec. 5-21-37. Drlg. 1,670 ft.
Stanolind O. & G. Co. No. 4-B Myers, C SW NW sec. 21-24-37. T.D. 3,682 ft.; S.D.W.O.; swb.; 800 ft. O.I. H. 6 hrs.; shot at 3,470 ft.
W. H. Street No. 4 Woods, C NE NE sec. 22-22-37 R.U.M.
Texas Co. No. 1 Corbin, C NW SW sec. 19-18-33. Drlg. 4,816 ft.; swb. 32 B.O. in 16 hrs.
Texas Co. No. 3 Falby, C NE SW sec. 8-22-37. T.D. 3,730 ft.; flwd. 182 B.O. in 21 hrs.; tstg.
Texas Co. No. 3 Fristoe, NW SE NE sec. 3-25-37. T.D. 3,480 ft.; S.D.; flwd. 95 B.O. in 15 hrs.
Texas Co. No. 1-N State, C SW SW sec. 30-17-35. T.D. 275 ft.
Texas Co. No. 1-O State, C SW NW sec. 36-17-34. T.D. 1,575 ft.

Texas Pacific C. & O. Co. No. 9-A State, Acct. 2, NW SW NE sec. 7-22-36. T.D. 3,825 ft.; tstg.
Texas Pacific C. & O. Co. No. 10-A State, Acct. 2, C SE NE sec. 7-22-36. M.I.M.
Texas Pacific C. & O. Co. No. 11 State, C W½ SW SW sec. 8-22-36. T.D. 195 ft.; W.O.C.
Two States Oil Co. No. 1 Etcheverry, SE SW NE sec. 10-20-36. Drlg. 3,285 ft.
Ted Weiner No. 1 Smith, NE cor. sec. 4-25-37. R.U.S.T.
Western Gas Co. No. 1 Curry, C SE SE sec. 1-24-36. Drlg. 175 ft.
Western Gas Co. No. 1 Matkins, C SE SE sec. 15-23-36. T.D. 330 ft.; S.D.

Eddy County

F. E. Baker No. 1 Eddy, NE sec. 12-22-27. T.D. 2,117 ft.; S.D.O.
Barnett Oil Dev. Co. No. 1 King Permit, C NW SE sec. 23-26-30. T.D. 980 ft.; set 12½-in. csg. 974 ft.
Carper Drlg. Co. No. 3 Gissler, C E½ E½ NW sec. 23-17-30. Drlg. L. 2,650 ft.
Danciger O. & R. Co. No. 4-A Turner, C SW SW sec. 18-17-31. Drlg. 1,220 ft.
Danciger O. & R. Co. No. 1-B Turner, CEL NE SE sec. 17-17-31. Loc.
D. & B. Oil Co. No. 2 Jenkins, SW NW NW sec. 20-17-30. T.D. 3,265 ft.; tstg.
D. & B. Oil Co. No. 3 Jenkins, NE NE NW sec. 20-17-30. M.I.M.
Emperor Oil Co. No. 4 Puckett, C NE NE sec. 24-17-31. T.D. 3,442 ft.; S.D. repairs.
Emperor Oil Co. No. 5 Puckett, C SW NE sec. 24-17-31. T.D. 3,384 ft.; L.
Finley & Cherry No. 1 Buchley, C NW NW sec. 28-16-31. Wildcat; T.D. 3,750 ft.; S.D.
Flint Prod. Co. No. 1-B State, SE sec. 20-17-30. Drlg. 3,830 ft.
C. J. Frederick No. 1 Reed, C NE SW sec. 28-24-28. T.D. 1,985 ft.; fsg.
F. W. & Y. Oil Co. No. 8-A Gissler, NE NW NE sec. 23-17-30. Drlg. 3,120 ft.
F. W. & Y. Oil Co. No. 9-A Gissler, C SE NE sec. 14-17-30. Drlg. 2,825 ft.; S.O. 2,720 ft.
F. W. & Y. Oil Co. No. 1-B Gissler, SW sec. 14-17-30. Drlg. L. 3,260 ft.
F. W. & Y. Oil Co. No. 2-B Gissler, C NW NW sec. 24-17-30. T.D. 3,505 ft.; S.&F.; 125 B.O.P.D.
F. W. & Y. Oil Co. No. 3 Jackson, C NW SE sec. 13-17-30. T.D. 2,953 ft.; fsg.
Grayburg Oil Co. No. 11 Burch, NE NE SE sec. 19-17-30. Drlg. L. 2,900 ft.
Grayburg Oil Co. No. 4 Keely, SE SW NE sec. 24-17-9. T.D. 3,588 ft.; to test.
H. A. Hartwell No. 1 Vandagrift, NE NE SE sec. 8-18-27. Drlg. 1,800 ft.
R. L. Holcomb No. 1 State, NW sec. 22-17-28. T.D. 1,971 ft.; C.O.; est. 20 B.P.D.
C. F. Ingram No. 1 Page, NE NE SW sec. 15-21-28. T.D. 1,495 ft.; S.D. for new rig.
B. M. Koehane et al No. 1 Shannon, SE cor. sec. 27-16-31. Drlg. 3,460 ft.
Paul Moran No. 1 Crawford & Smith, NW NW SW sec. 24-24-26. T.D. 842 ft.; S.D.
Murchison & Closuit No. 1 Foster, SE NE SE sec. 17-17-31. T.D. 1,940 ft.; S.D.R.
Murchison & Closuit No. 2-A State, NW SE SW sec. 16-17-31. Drlg. 3,080 ft.; S.O. 3,076-80 ft.
Pecos Valley Gas Co. No. 1 Sappenfield, C SE SE sec. 4-16-28. T.D. 1,770 ft.; S.D.; W.O.
Premier Pet. Co. No. 1 Beeson, NE SE SE sec. 28-17-30. Drlg. 1,760 ft.
Red Gulch Oil Co. No. 2 Keyes, C SW SE sec. 4-17-28. T.D. 780 ft.; S.D.; W.O.
Repollo Oil Co. No. 2-C McIntyre, NE cor. sec. 20-17-30. Drlg. 1,096 ft.
Repollo Oil Co. No. 4-D McIntyre, NW NE NE sec. 21-17-30. Drlg. 3,180 ft.; 500 ft. O.I.H. in 24 hrs.
Repollo Oil Co. No. 2-A Parke, NW NW NE sec. 22-17-30. Drlg. 2,763 ft.
Repollo Oil Co. No. 1-B Parke, SW cor. sec. 15-17-30. Drlg. 2,990 ft.
Paul Sarget No. 1 State, NE sec. 16-17-31. T.D. 3,749 ft.; P.B. 3,745 ft.; tstg.
R. A. Shugart No. 1 Coulthard, C NW SW sec. 35-18-31. T.D. 4,088 ft.; P.B. 3,920 ft.
W. K. Royalty No. 2 State, C NW NE sec. 16-17-31. Drlg. 3,075 ft.
W. O. Snyder No. 1 Pecos Irrigation, C NE SE sec. 15-25-28. T.D. 3,297 ft.; S.D.
Western Drlg. Co. No. 1-A Western, SE SW NW sec. 23-17-29. M.I.M.
Neil Wills No. 2-A State, CEL SE NE sec. 19-20-30. Drlg. 1,426 ft.

Chaves County

E. J. Fisher No. 1 Etz Permit, NE sec. 23-7s-26. T.D. 1,515 ft.; tstg. shutoff.
Grastorf & Caudill No. 1 Smith, C NE NE sec. 1-4s-29. Wildcat; T.D. 680 ft.
J. & L. Drlg. Co. No. 2 Hurd, SW sec. 11-11-26. T.D. 765 ft.; M.O.R.

Curry County

Bond & Harrison No. 1 Hart ranch, C NW SE sec. 13-2n-31. T.D. 3,258 ft.; S.D.O.

De Baca County

Land Owners Oil Co. No. 1 McAdoo, SW cor. sec. 16-1s-7e. O.W.; prep. to deepen from 5,850 ft.; S.D.
James D. Ward No. 1 Summers, NW NE SW sec. 17-4n-20. T.D. 260 ft.; S.D.
N. F. Woods No. 1 Jones, C NE SW sec. 17-4n-20. T.D. 25 ft.; S.D.

Dona Ana County

Jules C. Bertrand No. 1 Casad Permit, sec. 24-26-5e. T.D. 47 ft.; S.D.O.

McKinley County

S. Dysart No. 1 Govt., NE sec. 14-14-10w. T.D. 1,390 ft.; fsg.

Otero County

Fred Turner, Jr., No. 1 Ella Everett, C SE SE sec. 34-22-13. Drlg. 3,000 ft.
Fred Turner, Jr., No. 1 H. V. Everett, SE SE sec. 28 22-13. Drlg. 1,700 ft.

Roosevelt County

C. S. Peterson and Conquistadores Oil Co. No. 1 Good, NW SE SE sec. 28-5s-30. T.D. 623 ft.; S.D. for csg.

NORTHWEST NEW MEXICO

McKinley County

Claude Walker No. 6 fee, SE SW SE sec. 20-20n-9w. Drlg. 350 ft.

San Juan County

The Continental Oil Co. No. 72 Rattlesnake, NE SW NE section 2-29n-19w, in the Rattlesnake field, was completed in the Dakota at 785 feet, total depth, for 80 bbls. per day. Rig is being skidded to location for No. 73 Rattlesnake.

Continental Oil Co. No. 73 Rattlesnake, C NW SE sec. 2-29n-19w. R.U.
California Syndicate No. 1 Abreo, SW SW sec. 27-30n-11w. Drlg. 150 ft.

Socorro County

Central New Mex. Oil Co. No. 1 Belen Ld. Grant, NW sec. 16-3n-1e. S.D. 2,700 ft. for csg.

Torrance County

Chief O. & G. Co. No. 1 Pace, SE sec. 12-6n-7e. T.D. 2,020 ft.; fsg.

COLORADO

Archuleta County

Pagosa Oil & Dev. Co. No. 1 Macht, S sec. 32-36n-1w. Resumed at 328 ft. where it S.D. last December after landing 12½-in. on bttm.

Cheyenne County

Gulf Oil Corp. No. 1 Union Pacific-Larsen, C SE NW sec. 13-13s-49w. Drlg. 4,861 ft. with cable tools.

Fremont County

Isadore Spangler No. 1 St. Mary's, SE SE SE sec. 2-19s-70w. Drlg. 900 ft. in sh.

LaPlata County

N. Spatler No. 1 Bryce, SE SW SW sec. 31-33n-9w. T.D. 1,510 ft.; set whpstk. and drlg. by tools.

WYOMING

Albany County

Wyco Oil Co., Inc., No. 3 Chappel, NE NE NW sec. 33-21n-76w. T.D. 2,546 ft.; tstg.

Big Horn County

Prescott & Mileski No. 1 Govt., NE NW SW sec. 1-51n-93w. Drlg. 290 ft.; 12½-in. at 79 ft.
Clifford S. Johnson No. 1 Johnson, CEL NW NW sec. 24-51n-93w. Drlg. 219 ft.
Joan Oil Co. No. 1 Howell, NE NW NE sec. 32-55n-97w. Drlg. 2,340 ft.

Carbon County

Three new operations in Carbon County were getting under way. The Wyco Oil Co., Inc., is building derrick for a rotary test on the Oil Springs dome in its No. 1 Union Pacific. The location is about one-fourth of a mile to the northwest of the Ohio Oil Co. No. 1 Baker, NW NW SW section 2-23n-79w, which was drilled to 1,499 feet, where it tested the Muddy, and plugged back to 560 feet and completed in the Frontier for 60,000 feet of gas. Oil Springs is a narrow faulted anticline formed in the upper Cretaceous beds with the Frontier formation at the surface.

The Ohio Oil Co. is moving in materials for a test to the Tensleep in its No. 1 A. J. Hazlett Estate on the northwest end of the Allen Lake structure. The location is a southeast offset to its No. 1 Kanawha, completed in 1936 in the Sundance at 2,661 feet for 17,547,000 feet of gas per day. Two big gas wells have been drilled 4 miles to the southeast, but no test has been drilled below Sundance.

The third new operation is the Ohio Oil Co. No. 1 State-Griffin, at the southern end of the Big Medicine Bow structure. It is located nearly three-fourths of a mile southeast of the Ohio-California No. 2 State, C NW NW section 36, which was completed early in 1936 in the first Sundance for 80 bbls. an hour after plugging off water in the second Sundance.

Wyco Oil Co., Inc., No. 1 Union Pacific, NE SE NE sec. 3-23n-79w. Bldg. drk. (first report).
Ohio Oil Co. No. 1 Hazlett Est., NE SW NE sec. 34-23n-79w. M.I.M. (first report).
Ohio Oil Co. No. 1 State-Griffin, SE SW NE sec. 36-21n-79w. M.I.M. (first report).
Italo Pet. Co. No. 1 Tunney-Bragg, NE SE NW sec. 11-26n-81w. Drlg. 1,403 ft.
Sinclair-Wyoming Oil Co. No. 12-B Wertz, SE NW NW sec. 7-26-89w. T.D. 5,713 ft.; fsg. 6 stds. D.P.
Ohio Oil Co. No. 14 H.&C., SE NW SW sec. 35-20n-78w. Drlg. 2,985 ft.

Converse County

Sand Creek Oil Co. No. 1, C SE SE sec. 29-32n-69w. Drlg. 600 ft.; 8¼-in. at 348 ft.
Ainsworth Oil Co. No. 1 Marberger, NE SE NE sec. 34-32n-69w. Cmtd. 6¼-in. at 784 ft.
Chadron-Osage Oil Co. No. 1 State, SW SW SW sec. 16-32n-69w. Res. at 4,060 ft.
Wyshawn Oil Co. No. 1 Lindley, NW SE sec. 34-32n-69w. Drlg. 500 ft.; under contr. to go to 2,000 ft.
Hall-Thornton, et al No. 1 Roth, SE NW SE sec. 13-32n-69w. Drlg. 525 ft.; 8¼-in. at 493 ft.

Fremont County

Sinclair-Wyoming Oil Co. No. 2-B Muskrat, NW NW NE sec. 4-33-92w. Cmtd. 7-in. at 5,434 ft.; W.O.C.
Stanolind O. & G. Co. No. 1 Govt., C SE SE sec. 3-33n-96w. Cg. in Morrison at 8,279 ft.
Consolidated Oil Properties No. 3 Ewart, C SW SE sec. 16-1n-14w. T.D. 700 ft.; rng. form. test.
H. Kenyon Burch No. 9 Govt., C NW NW sec. 27-3n-1w. Drlg. 239 ft. (Pilot Butte).
Ben Stewart No. 1 Darnell, NE SE sec. 26-3n-1w. Res. at 875 ft.; prep. to run 8⅝-in.

Hot Springs County

Delaware Oil Co. No. 1 Govt.-Skelton, C SE SE sec. 2-43n-96w. Lost hole at 400 ft.; skd. rig; drlg. 200 ft. new hole.
California Exploration Co. et al No. 1 Govt., NE SE NE sec. 12-44n-97w. T.D. 3,807 ft.; drlg. on wool plg. at 3,804 ft.
J. W. Bales No. 1 Govt., CWL SE SW sec. 28-43n-93w. T.D. 1,082 ft.; prep. to acid.; S.O. in Madison at 902-1,025 ft.

Natrona County

The Stanolind Oil & Gas Co. No. 8 T.P.-Wyoming Association, C NW NW section 35-40n-79w, Salt Creek field, recently completed for 11 bbls. per hour through a 3/16-inch bean, was acidized with 2,000 gallons and increased to 17 bbls. per hour. Top of Tensleep was at 3,803 feet and casing was set on bottom at 4,011 feet and perforated.

Stanolind company is going ahead with its No. 26 Wyoming Associated for which location was released last November and then suspended.

The General Petroleum Corp. test on the Cole Creek structure looks as though it will make a well in the First Wall Creek sand in spite of earlier discouraging reports. Tests made at a total depth of 6,840 feet were not very promising. When drilling was resumed to go to the second Wall Creek, it was found that the hole had bridged 40 to 50 feet off bottom and when it was cleaned out approximately 50 bbls.

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of free oil was circulated out of the hole, coming from below the bridge. Drilling then was resumed, it being the intention to core the entire interval between the first and second sands. Additional saturation was cored below 6,840 feet, sand continuing to 6,878 feet. The top was at 6,748 feet, giving an interval of 130 feet for the first Wall Creek. Last depth given was coring at 6,968 feet. The second Wall Creek is the principal producing horizon in Salt Creek, to the north, and was productive on the Midway dome to the west, although at Midway there was water in the first sand.

Stanolind Oil & Gas Co. No. 26 T.P.-Wyo. Asso., C SE NW sec. 35-40n-79w. Digging cel. and pits.
General Pet. Corp. No. 1 Govt., C NW SE sec. 21-35n-77w. Drlg. 6,931 ft.; headed for Second Wall Creek.

Niobrara County

A. B. Cobb made a location in Lance Creek for No. 3 Novick-Ong on the west side, one location west of the Cobb-Holly No. 2 Novick and northeast offset to Price's No. 1 Lamb. Location for the MacKinnie Oil & Drilling Co. No. 3 Thompson, NW NW NE section 7-35n-65w, was abandoned and number assigned to No. 4 Thompson.

A. B. Cobb et al No. 3 Novick-Ong, SW SE SW sec. 6-35n-65w. Rng. dk. (first report).
MacKinnie Oil & Drlg. Co. No. 3 Thompson, NW NE NW sec. 7-35n-65w. Cmtd. 13⅜-in. at 303 ft.; W.O.C. (form. No. 4 Thompson).
Minnelusa Oil Co. No. 2 H. & M., NW NE NE sec. 8-35n-65w. R.U.R.
Continental Oil Co. No. 11 Tom Bell Cattle, SE SW SW sec. 27-36n-65w. Drlg. 1,460 ft.; 13⅜-in. cmtd. 366 ft. with 225 sacks.
Hewitt Bros. and Manning No. 1 Pecklow, SE SE SE sec. 1-35n-66w. R.U.R.
Continental Oil Co. No. 5 Joss, SW SW NE sec. 6-35n-65w. Drlg. 2,700 ft.
Ohio Oil Co. No. 10 Putnam, NW SE NW sec. 4-35n-65w. Drlg. 1,145 ft.
Argo Oil Co. No. 5 Ford, C SW SE sec. 33-36n-65w. Drlg. 2,225 ft.
H. D. Moore et al No. 1 Beregren, NW sec. 23-35n-63w. Drlg. 937 ft. in Sundance; top Morrison 587 ft.
Continental Oil Co. No. 3-A Diehlman, SE SE SW sec. 5-35n-65w. Drlg. 5,002 ft. in anhyd.

Park County

Paul Stock No. 1 Govt., SE SE NE sec. 20-53n-101. R.U.R. to deepen; O.W.D.D. from 2,015 ft.
Ohio Oil Co. No. 4 Mack-O.P.C.-4, SE SW SE sec. 30-58n-99w. T.D. 3,092 ft.; P.B. to 2,850 ft.; cmtd. 8⅝-in. at 2,790 ft.; tstg.
Resolute Oil Co. No. 4 N. P., C NE NW sec. 21-57n-101. Shot 40 qts. at 8,625-54 ft. in Frontier; C.O.; S.G., no oil.
Resolute Oil Co. No. 3 N. P., C NE NE sec. 20-57n-101w. Pmpd. 7 to 8 B.P.D. at 8,670 ft.; not officially comp.

Sweetwater County

Sinclair-Wyoming Oil Co. No. 78, SW SW NW sec. 11-26n-90w. Cmtd. 12½-in. at 850 ft.; W.O.C.
Selegna Oil Co. No. 1 Union Pacific, SW SW sec. 11-20n-104w. Drlg. 4,040 ft. in Morrison; D.S. in Dakota at 3,842-50 ft.; showed W.

Weston County

Chas. F. Martens No. 8, SE SE NW sec. 24-46n-64w. S.D. 1,000 ft.; repairs.
Chas. Stough No. 10, SE SW NW sec. 4-46n-63w. Cased off S.O.&G. at 157 ft. and drlg. ahead.
Patterson Oil Co. No. 19, CSL SE SE sec. 17-46n-63w. Drlg. 225 ft.; commercial show at 152-225 ft.
John Brorphy No. 1 George, SW SE NW sec. 12-48n-64w. T.D. 2,030 ft.; U.R. 6⅝-in. from 1,982 ft. for W.S.O.

MONTANA

Additional outlet for Montana crude from the Cut Bank field was assured with the announcement in Spokane, Wash., of the organization of the Inland Empire Refineries, Inc., to construct a 2,500-bbl. refinery in that city following the signing of a contract with the Glacier Production Co. for its production. The refining company is closely affiliated with the Wasatch Oil Refining Co., of Salt Lake City, which also has under construction a 1,500-bbl. plant at Pocatello, Idaho, to run on crude contracted from a group of independent operators in Cut Bank. The Inland Empire company is capitalized for $317,000 under Washington laws.

While the Pocatello and Spokane plants are both closely allied with the Wasatch Oil Refining Co., being controlled by the same group of financial interests, they are to be conducted as separate organizations with some other interests associated with them. Joseph Drumheller, pioneer operator in Cut Bank, and some of his associates, have interests in the Spokane plant.

The Glacier Production Co. is the oil and gas subsidiary of the Montana Power Co., a big Montana public utility. The company has an estimated developed production of 2,000 to 3,000 bbls. per day in Cut Bank. Its wells have been shut in for some time. It is reported that the deal for the sale of its production is based on the Mid-Continent gravity scale. William H. McIntyre, Jr., president of the Wasatch Oil Refining Co., Henry D. Moyle and K. W. Yeates, all of Salt Lake City, are the principal financial interests identified with the refining companies. The deal for the Cut Bank crude followed the granting of a reduction in freight rates from Cut Bank to Spokane by the Great Northern Railroad.

Big Horn County

P. O. Oil & Gas Co. No. 1, NW NE NE sec. 25-9s-35e Drlg. 340 ft.
E. L. Dana No. 1 Hardy, SW NW sec. 22-9s-35e. S.D. 700 ft.

Carbon County

R. C. Tarrant No. 1, 500 ft. W of C sec. 3-6s-18e. R.U.
R. C. Tarrant No. 2 Heare, NW SE NW sec. 14-6s-19e. Redrlg. 1,700 ft.
Sha-Wa Pet. Co. No. 1 Govt., SW SW NE sec. 35-9s-23e. T.D. 3,223 ft.; P.B. to 3,060 ft.; fsg.
Miracle Oil Co. No. 2 Govt., CWL NE SE sec. 3-6s-23e. Drlg. 2,371 ft.; 5⅜-in. at 2,360 ft.

Fergus County

Baugham & Singley No. 1 Skaggs, C NW SW sec. 7-15n-20e. Drlg. 525 ft.

Glacier County

An extension of the gas area of the Cut Bank field is indicated in the Glacier Production Co. No. 1 McNamar Unite, an outside well at the north of the gas area. It had 2,500,000 feet of gas in the Moulton sand at 2,490-96 feet. It is drilling ahead to the Cut Bank sand.

Texas Co. No. 1 Lindquist, C SE SE sec. 17-32n-5w. Drlg. 2,245 ft.
Glacier Prod. Co. No. 1 McNamar, CEL SE NE sec. 15-36n-5w. Drlg. 2,525 ft.
Santa Rita O. & G. Co. No. 8 Tribal, C NE SW sec. 16-35n-6w. Drlg. 2,850 ft.; W. at 2,400-50 ft.; csd. off with 8⅝-in. at 2,615 ft.
A. B. Cobb No. 1 State, C NE NE sec. 30-37n-4w. T.D. 2,592 ft.; S.D. until spring.
Santa Rita O. & G. Co. No. 3 Govt., C SW SW sec. 4-32n-5w. Drlg. 1,625 ft.; Colo. 625 ft.; 10¾-in. 650 ft.

Hill County

Burton & Hole No. 1 Waldrip, C SW NW sec. 12-32n-17e. Drlg. 631 ft.

Judith Basin County

Fletcher E. Hunt No. 3, NW SE NE sec. 30-14n-15e. Drlg. 1,810 ft.

Lewis and Clark County

Lewis & Clark Oil Synd. No. 1 Heilman, NW NW SW sec. 11-18n-5w. Drlg. 2,437 ft.

Park County

Ben W. Ryan No. 1 Burgee, SE SW NW sec. 28-2s-11e. Drlg. 1,278 ft.

Toole County

Chas. Grant et al No. 1 Anderson, SE NE NE sec. 26-35n-4w. T.D. 1,980 ft.; cmtd. 6⅝-in.; drlg. plg.
R. G. Parrent No. 1 Anderson, C SW SE sec. 26-35n-4w. T.D. 1,933 ft.; rng. 6⅝-in.
B. A. S. Arnow No. 1 Govt., SE SE SW sec. 18-35n-2w. T.D. 1,644 ft.; acid. 500 gals.
Superior Pet. Co. No. 7-A, NE NW NW sec. 12-35n-3w. Skdg. rig from No. 7.
West Kevin Community Lease, Inc., No. 1 McClary, SW NE NW sec. 3-34n-4w. Drlg. 1,550 ft.

Yellowstone County

Broadview Dome Oil Co. No. 1 Stallinberger, NE NE SW sec. 18-3n-23e. S.D. 4,565 ft.
Riverton Oil Co. No. 1 Fox, CEL NW NE sec. 14-2n-23e. T.D. 1,795 ft.; cmtd. 8¼-in. on bttm.; W.O.C.

UTAH

Grand County

Utah Southern Oil Co. No. 1 Hyde, SE NW NW sec. 33-22s-22e. T.D. 6,715 ft.
Columbia Crude Corp. No. 1 Rath, NW SW SE sec. 12-25s-20e. Drlg. 3,390 ft. in hd. salt.
Cane Creek Oil Co. No. 1 Govt., NW SW sec. 31-26n-21e. Drlg. 1,059 ft. in gr. L.; S.O.&G. in sd. at 945-949 ft.
Crescent Eagle Oil Co. No. 1, SW SE sec. 4-22s-21e. O.W.D.D.; old T.D. 4,006 ft.; R.U. to go to 6,000 ft.

Summit County

Longwell Pet. Co. No. 1, SE SW SE sec. 35-3n-5e. Drlg. 2,650 ft.

NEBRASKA

Sioux County

The Union Oil Co. of California has released a location for an important test to be drilled in Sioux County, Nebraska, about 40 miles southeast of the Lance Creek field, in Wyoming, on the Agate Springs anticline. Contract has been let to Manning & Martin, Inc., of Denver, and preparations are being made to move in rotary equipment. Location is in the SE cor. section 15-28n-55w. This is the first operation drilled by the Union company in the Rocky Mountain area since it disposed of its holdings in that area to the Continental Oil Co. in 1929.

The Agate Springs anticline is a Tertiary controlled structure with 250 feet of closure. It is an elongated, symetrical anticline 15 miles in length and 3 miles in width at the widest point. Test is to be drilled to the granite at about 6,500 feet. Location is about a mile south of a well drilled in the NE cor. of section 15 in 1921 by Associated Oil Co. of Wyoming, which was abandoned at 4,554 feet. Dr. Harold J. Cook interested the Associated in drilling the first test after he and Prof. E. F. Schramm, Nebraska geologist, had surveyed the structure. Christian Vrang, of Los Angeles, checked the structure for the Associated. Horace D. Thomas, of the University of Wyoming, made a plane table survey for the Union. Four structures in the immediate vicinity of the Agate structure were leased last fall by other companies following surface and geophysical surveys. One of these is held by the Amerada Petroleum Corp., and another by the Felmont Oil Corp.

Union Oil Co. of Calif. No. 1 Cook, SE SE SE sec. 15-28n-55w. Loc.

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Tri-state Operators Turning Attention to New Showings

By GEORGE WEBER

SHREVEPORT, La., Mar. 28.—Attention in the North Louisiana and Arkansas sector shifted in the past week from the two outstanding developments of the previous two weeks to newer discoveries. The Kerr-Lynn wildcat in the Magnolia area of South Arkansas has as yet failed to bring in commercial production, and the Sutton-Zwolle deep test in the Blue Lake area of Sabine Parish is an apparent failure. Both areas are considered as potential fields, however, despite the failures of the two tests.

Center of attention during the past week has been a 2¼-mile southwest outpost test to the Jefferson area in Marion County, Texas. Sharing in the spotlight were the deep Shongaloo test in Webster Parish the wildcat in the Village area of Columbia County, South Arkansas, and the Buckner, Shuler, Cotton Valley, Sligo and Blanchard areas.

Jefferson Discovery

What appeared to be the most important extension to the Jefferson area in many weeks held the interest of Rodessa operators. Arkansas-Louisiana Gas Co. No. 1 Pitts, in the Charles Lockhart Survey, tested considerable quantities of gas in the Hill zone, and is considered a likely producer in the Henderson sand, producing horizon in the Jefferson-Lodi extension of Rodessa.

The test cored the top of the Anhydrite at 5,266 feet, the Massive Anhydrite at 5,533 feet and the base of the Massive at 5,778 feet. At 5,918-21 feet a 5½-minute drill-stem test showed recovery of an estimated 30,000,000 feet of gas. The well was shut in with a bottom-hole pressure of 2,400 pounds. Successful completion of this outpost for an oil well in the lower sand will prove a considerable extension to the Jefferson area, and will doubtless add greatly to the activity in the section, already the most active drilling center in Rodessa.

The Shongaloo gas field of northern Webster Parish, Louisiana, is also a center of interest. Magnolia Petroleum Co. No. 1 Sexton Unit, section 32-23-9 cored gas and distillate sand at 8,298-8,310 feet and 8,370-74 feet, the first showings in the deep test. The well is being carried deeper in search of oil production in the horizons corresponding to Cotton Valley to the south, and was drilling hard sandy lime at 8,599 feet at latest report.

South Arkansas Developments

In South Arkansas, the center of attention will shift in the near future to the Standard Oil Co. of Louisiana No. 1 Phillips, a wildcat drilling in the vicinity of Village, Columbia County, The test is approaching critical depth, and has already shown good indications of opening a field.

After coring saturated sand at 4,618-22 feet in an unimportant upper horizon, the test cored another section at 5,327-36 feet which showed good odor and saturation. A drill-stem test was attempted at 5,320-36 feet but the shoulder did not hold. Operators are reaming down to make a second drill-stem test. The sand in which the test is now bottomed is of the Lower Marine series, and may correspond to the Morgan sands of the Shuler field.

A second disappointment in the Buckner field further indicated limits to extent in the newly developed area. Following a failure in a southwest outpost two weeks ago, a second outpost this week further delimited production on the southwest. The test, Standard Oil Co. of Louisiana No. 1 Bodcaw-Barbara, in section 18-16-22, about a mile southwest of the same company's No. 1 McKean producer, topped the Big Lime at 7,292 feet. Two feet of core to 7,294 feet tested salt water.

Attention is now directed to the Standard No. 1 Crone, in section 8-16-22, a short distance northeast of the only producer in the field. The Crone No. 1 has cored the top of the lime at 7,264 feet and has saturation at 7,264-72 feet. A drill-stem test taken several days ago showed a good test of oil. However, while running casing in the hole the pipe stuck at 6,970 feet.

The crew was circulating oil to loosen the casing, when the drill line broke and the pipe dropped in the hole. The circulating oil caught fire, burning the derrick floor and causing the derrick to fall. Derrick was rebuilt after the fire was extinguished. Operators are now fishing for the casing, and hope to have the well on production shortly. Total depth is 7.272 feet.

Kerr-Lynn Wildcat

In the Magnolia district, fate of the Kerr-Lynn Oil Co. No. 1 Barnett, in section 14-17-20, is as yet unknown. After considerable difficulty in drilling the well and setting casing, the operators were rewarded with an excellent showing, when the well came in flowing over the derrick several weeks ago. The poor condition of the hole is blamed for subsequent failures to get oil production. Sulfur water and salt water have been the only shows since shortly after the successful test.

This past week, in an effort to shut off all water, the crew recemented the hole. Perforations were made with one shot each at the following depths: 7,070, 7,100, 7,140, 7,180, 7,220, 7,260, 7,340, 7,380, 7,420, 7,460 and 7,540 feet. Cement retainer was set at 6,962 feet and hole cemented to that depth. Following this, perforations will be made and completion again attempted.

At Zwolle, in the Blue Lake shallow field of Sabine Parish, attempts to complete the Sutton-Zwolle Oil Co. No. 1 Sabine Lumber Co. met with further disappointments. The well was acidized with 750 gallons and tested some oil. Following with 3,000 gallons of acid, the well tested dry with but a showing of oil. Total depth is 3,857 feet.

In the same area, south of the main Bull Bayou field in De Soto Parish, Petroleum Heat & Power Co. No. 1 Williams, ignited while operators were completing. Cause of the fire was unknown.

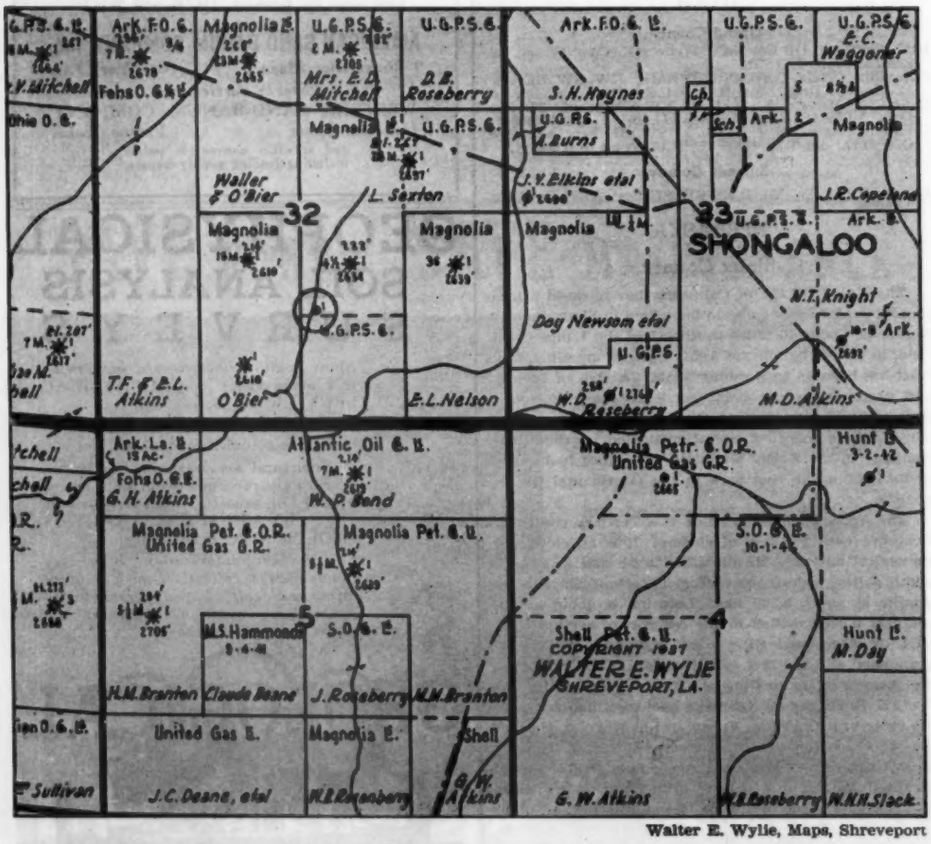
Blanchard Test

In the Blanchard area of Caddo Parish, Olson Drilling Co. No. 1 Sharp, section 10-18-16, perforated casing at 6,011-21 feet and had no showing. Perforations were next made at 6,002-11 feet and the well started flowing mud. The crew pumped mud into the well to prevent a blowout, and made surface connections for a test. Total depth is 6,065 feet.

Rodessa Completions

The Caddo Parish section of Rodessa had three routine completions during the week, and the Miller County, Arkansas, area gained one new well.

J. S. Rushing No. 2 Alexander, section 3-23-16, made 25 bbls. per hour on a ½-inch choke with tubing pres-



Walter E. Wylie, Maps, Shreveport

The deep Shongaloo test, Magnolia Petroleum Co. No. 1 Sexton Unit is attracting considerable attention to the North Webster Parish field, after coring good shows of gas and distillate at 8,298-8,310 and 8,370-74 feet. The test is coring deeper

sure of 450 pounds, casing pressure of 720 pounds and total depth of 5,972 feet.

Shell Petroleum Corp. No. 1-B U. S. Government, section 3-23-16, gauged 8 bbls. per hour on a ¼-inch choke, with tubing pressure of 175 pounds, casing pressure of 700 pounds and total depth of 5,973 feet.

Standard Oil Co. of Louisiana No. 2 Spearman, section 3-23-16, was completed for 182 bbls. per day on a 16/64-inch choke with a tubing pressure of 650 pounds, casing pressure of 925 pounds and total depth of 5,972 feet.

In Miller County, Roger Lacy No. 2 Grogan, section 15-20-28, came in making 47 bbls. per day on a 1-inch choke with tubing pressure of 100 pounds, casing pressure of 400 pounds and total depth of 6,025 feet.

Estimated Daily Production

Estimated daily gross production, all companies, for the week ending March 25, follows:

NORTH LOUISIANA

	Bbls.
Bellevue	725
Caddo light	3,820
Caddo heavy	2,540
Converse	575
Cotton Valley heavy	100
Cotton Valley light	*5,480
De Soto and Red River	1,440
Elm Grove	300
Haynesville	2,925
Holly	75
Homer	2,570
Lisbon	10,730
Pleasant Hill	110
Rodessa	40,775
Sarepta-Carterville	210
Sligo	765
Sugar Creek	315
Urania	2,790
Zwolle	875
Total	77,120

SOUTH ARKANSAS

Buckner	205
Champagnolle	1,190
El Dorado	1,845
Lisbon	270
Miller County	400
Nevada	675
Rodessa	8,210
Shuler	18,490
Smackover light	2,000
Smackover heavy	15,700
Stephens	560
Troy	1,295
Urbana	1,180
Total	52,020

Texas side of Rodessa field, 37,065 bbls. daily.
*3,680 bbls. is distillate.

Lisbon Completions

The Lisbon field of Claiborne Parish gained four good producers. Activity in that field may see an increase due to the new 40-acre spacing rule adopted, which it is believed will prove an attraction to major operators.

Hollifield & McFarland No. 3 Patton Estate, section 2-20-5, came in making an initial of 75 bbls. per hour through a 1-inch choke. Tubing pressure was 170 pounds. Total depth is 5,249 feet.

J. R. McMurray No. 2 Bean, section 32-21-4, was completed for 25 bbls. per hour through a 16/64-inch choke with tubing pressure of 125 pounds and tubing set on a packer. Total depth is 5,174 feet.

E. T. Oakes No. 1 Lloyd, section 3-20-5, made 71 bbls. per hour on initial gauge through open tubing, total depth 5,328 feet. This well is in the southwest extension area.

A. O. Olson No. 8-A Patton, section 30-21-4, made 32 bbls. per hour on a 20/64-inch choke, tubing set on packer. Tubing pressure was 225 pounds. Total depth is 5,080 feet.

Shuler Developments

The northeast outpost well in the Shuler field, in Union County, Arkansas, Alice Sydney Oil Co. No. 1 Powledge, section 7-18-17, topped the Jones sand at 7,577 feet. The base of the sand was at 7,630 feet and the top of the Big lime 7,688 feet. The test is coring ahead at 7,702 feet. Several other tests in the field are drilling and coring below the top of the Big lime.

During the week one producer was completed in the field, Marine Oil Co. No. 4 fee, section 17-18-17, making 1,010 bbls. in 13 hours through a ½-inch choke with tubing pressure of 800 pounds, casing pressure of 100 pounds. Total depth is 7,590 feet.

An increased daily production allowable for the South Miller County Texarkana oil field during April was announced by the Arkansas Conservation Board.

The augmented allowable will remain at 15,000 bbls., the same as this month, but the actual allowable will be hiked from 8,976 to 9,304 bbls. daily for the 72 producing wells.

The board reduced the per well daily production allowable for the Jones sand of the new Shuler field near here from 700 to 650 bbls.

The railroad commission reduced from 5,000 to 3,500 feet per barrel the gas-oil ratio permitted in the Dees-Young horizon of the Rodessa field in eastern Texas.

As a result of this change, its Rodessa field rule No. 10 provides that any well with a ratio in excess of 3,500 feet of gas per barrel of oil produced shall be allowed to produce daily only a total volume of gas equivalent to the volume obtained by multiplying the daily allowable, as determined by Rule 19, of the well by 3,500 feet. This amount of gas shall be known as gas limit for oil wells. Monthly test reports must be made of all such wells. The change is effective April 1.

Central West Fields

(Continued from Page 210)

district, Globe Oil Co. and others was moving in material for No. 2 B. W. Barrett. Red Hill district, F. F. Gibson and others No. 2 A. E. Bryant, an old gas well drilled deeper, started at 50 bbls. per day from Jackson sand at 962-96 feet. It had been shot with 100 quarts. F. F. Gibson and others No. 2 Dode Taylor made a 25-bbl. natural flow from Barlow sand at 1,041-69 feet, and was completed.

Grayson County, Yeaman district, A. V. Smith and others No. 1 Guy Patterson was moving in.

Hancock County, Goering district, Cumberland Petroleum Co. No. 1 Clarence Dunleavy is a dry hole in Bethel sand at 692-710 feet.

Logan County, 1½ miles southwest of Dunmore, Kersey and others No. 1 G. W. Adler is a dry hole. total depth 760 feet. Showings of oil were had at 522-27 feet and 557-58 feet.

McLean County, North Livermore district, J. C. Miller, trustee, No. 10 Mrs. Fannie Foley, rigging up; the Petroleum Co. No. 1 Kelly Atherton, location; W. K. Snyder and others No. 1 W. Lloyd, moving in. Island district, South Penn Oil Co. No. 4 Alma Nall, drilling at 835 feet. South Penn Oil Co. No. 4 H. K. and John Kirtley, had Bethel sand at 1,797-1,800 feet, dry; total depth 1,800 feet; plugging back to Jett sand, to shoot with 80 quarts at 1,403-27 feet.

Muhlenberg County, Bremen district, Peerless Oil Co. No. 1 C. C. Gossett deep test, drilling at 1,150 feet.

Ohio County, Fordsville district, Cumberland Petroleum Co. and others No. 1 Joint Line deep test. drilling at 2,080 feet; black shale at 1,906-2,020 feet. Friendship Church district, Henry Scholl and others No. 4 Ida Farmer, dry hole, total depth 700 feet. Narrows district, Murphy, Patrick and others No. 3 M. P. Evans, dry hole, total depth 594 feet; Barlow sand 586-88 feet.

Todd County, 1 mile east of Fairview, I. A. Polhamus No. 1 J. W. Hall, dry hole, total depth 807½ feet; small oil showing at 706-07 feet.

Webster County, Sebree district, I. B. Browning and others No. 6 J. R. Ramsey, deep test, hauling 300 feet of 10-inch pipe to resume drilling after being shut down at 300 feet for four months.

EASTERN KENTUCKY

ASHLAND Ky., Mar. 28.—Three oil completions are included in the report of operations in the Eastern Kentucky field in the past week.

South Penn Oil Co. completed No. 105 on the Flahaven Land Co. land on Big Sinking in the Big Sinking district of Lee County at a total depth of 1,122 feet. The well has a daily production of 20 bbls. of oil.

C. G. Mays completed No. 9 Medley S. Cole on Little Sinking, in the Big Sinking district of Lee County, at a total depth of 1,023 feet. The well made an initial production of 75 bbls. of oil.

South Penn Oil Co. completed No. 12 William Adams and Lamberson land on South Fork in the South Fork district of Powell County with a production of 2 bbls. of oil daily.

Operations by counties are as follows:

In Pike County, Inland Gas Co. is still fishing at No. 196 Helen Leslie on Levisa Fork and is moving to location of No. 199 on the same land.

In Floyd County, Kentucky-West Virginia Gas Co. is idle at No. 567 M. Slone and M. D. Slone on Levisa Fork, and is down 965 feet in sandy lime in No. 569 Jeff Jervis on Home Branch of Buffalo Creek. The same firm is setting machine at No. 570 Clarence Neeley farm, in the same locality, and was drilling at 1,765 feet in slate and shells in No. 5233 on the John F. Burchett farm on Cow Creek.

In Martin County, Kentucky-West Virginia Gas Co. had reached the 1,305-foot mark, in sand, in No. 5237 on the C. W. Preece farm on Coldwater Fork, and is moving to location of No. 5239 on the same land. The same firm is fishing for tools in No. 5238, M. M. Pratt land nearby, and is grading location of No. 5240 on the C. W. Preece land on Peg Fork of Coldwater Fork.

In Lee County, Fleiger Oil Co. was drilling below 180 feet in No. 1 Andrew Combs, (Marvin Hallow) on Billie's Fork.

West Texas Fields

(Continued from Page 208)

daily after 6,000-gallon acid treatment at 3,506-19 feet, total depth, Rotan pool.

General Crude No. 7 J. A. Young pumped 18 bbls. daily after 2,000-gallon acid treatment at 2,905-20 feet, total depth, Royston field.

Magnolia Petroleum No. 1 J. M. Smith, abandoned dry at 3,572 feet, total depth.

Taylor County

A. Findlay No. 1 Bowles Estate, abandoned dry at 2,121 feet, total depth, plugged back to 2,024 feet.

Shackelford County

Grady Bailey No. 4 Diller, 10 bbls. daily from 518-27 feet, total depth.

Frank Whitten and D. L. Byars No. 1 Diller, abandoned dry at 545 feet, total depth.

Hoffman & Page No. 26 J. P. Morris, 20 bbls. daily after 20-quart shot at 1,581-1,600 feet, total depth, Bluff Creek pool.

Callahan County

Bartray & Hart No. 1 N. M. George, abandoned dry at 820 feet, total depth.

PANHANDLE COMPLETIONS

(24-hour gauges)

Carson County

Magnolia Petroleum Co. No. 37 fee, 2,895-2,950 feet, 236 bbls.

Gray County

Bradshaw Oil & Gas Co. No. 7 Arnold, 3,200-85 feet, 789 bbls. Gray County Producing Co. No. 4 Chapman, 2,587-2,612 feet, 1,952 bbls. Gulf Oil Corp. No. 1 Hughey A, 3,120-3,250 feet, 687 bbbls. Magnolia Petroleum Co. No. 20 fee, 2,900-70 feet, 419 bbls. S. & M. Oil Co. No. 2 Worley, 3,160-3,238 feet, 720 bbls. Sunray Oil Co. No. 3 Ferguson, 2,925-34 feet, 1,000,000 feet of gas.

Hutchinson County

Continental Oil Co. No. 6 Johnson C, 3,055-60 feet, 418 bbls. Holmes & Holmes No. 5 Moore, 3,018-90 feet, 685 bbls. Crosbie, Inc., No. 27 Pitts, 2,710-2,838 feet, 506 bbls.

Hansford County

Texas Mineral Investment Co. No. 1 Norton, 3,050-90 feet, 500,000 feet of gas.

Potter County

Canadian River Gas Co. No. 23 Bivens A, 2,575-3,076 feet, 9,550,000 feet of gas.

Southwest Texas Fields

(Continued from Page 197)

bbls., ½-inch choke. Oilton field: M. E. Brooks No. 4 Uzzell, 2,015 feet, perforated casing 1,986-88 feet, 6 bbls. per hour, pumping; Cox and Hamon No. 10 Garcia, 1,905 feet, 120 bbls., pumping; Cox and Hamon No. 9 Garcia, oil sand 1,904-13 feet, 120 bbls., pumping; Daubert and Lipscomb No. 3-A Garcia, perforated casing 1,998-2,004 feet, 195 bbls., ⅝-inch choke; Daubert and Lipscomb No. 1-A Garcia, oil sand 1,996-2,015 feet, 150 bbls., ⅝-inch choke; Killam and Campbell No. 5 Thompson, 2,478 feet, abandoned.

Refugio County

Refugio field: Houston Oil Co. No. 37 Rooke, 6,232 feet, 178 bbls., 3/32-inch choke.

Calhoun-Victoria Counties

Heyser field: Gulf Oil Corp. No. 2 R. R. Bonner, 5,748 feet, perforated casing 5,745-47 feet, 129 bbls., 7/64-inch choke. Placedo field: Stanolind Oil & Gas Co. No. 1 Vandenberg and Hill, 6,510 feet, perforated casing 6,365-70 feet, 130 bbls., ½-inch choke.

Canadian Fields

Completions and Operations in Northwest and in Ontario

By VICTOR LAURISTON

CHATHAM, Ontario, Mar. 26. — In North Turner Valley, Royalite Oil Co. No. 29 Turner Basin, LSD 7, section 27-20-3w5, finished at 6,920 feet after drilling 645 feet in the Madison limestone. Tubing was run and the hole cleared by gas lift. It proved to be only a small producer, and will be acidized.

West Flank Lime Tests

On the west flank of South Turner Valley, West Flank Oil Co. No. 1, S half LSD 1, section 32-18-2w5, is still cleaning out following a shot in the lime.

In section 20-18-2w5, Spy Hill Royalties No. 1, LSD 16, was shot with 600 quarts. After cleaning out, it started to flow by heads. It is being acidized.

In section 29-18-2w5, Davies Petroleums No. 1, LSD 2, finished below 7,305 feet, more than 408 feet in the Madison limestone. It has cleaned out and is testing production. It looks like a good producer. The well made a record in lime drilling, the job taking only 11 days. Sunburst Oil Co. No. 1, N half LSD 1, same section, is below 6,935 feet after getting the Madison limestone at 6,705 feet.

In section 28-18-2w5, Richland Royalties No. 2, LSD 5, is finishing around 6,940 feet. It got the Madison at 6,410 feet and is being finished with cable tools, with considerable crude in the hole.

In section 21-18-2w5, Brown Oil Corp. No. 4, LSD 4, got the Madison limestone at 6,253 feet and cemented casing at 6,268 feet. Location is less than a mile due south of Davies-Royalite No. 2, the second largest crude producer, but only a little west of Newfold Royalties No. 1, which finished a small naphtha well.

West Side Drilling

In section 5-19-2w5, West Central Turner Valley, Vulcan-Brown Petroleums No. 1, LSD 10, is below 5,084 feet. Mercury Royalties No. 1, LSD 8, is below 3,875 feet.

Still farther west, East Crest Oil Co. No. 6 is spudding in LSD 6, section 6-19-2w5. Rotary tools are being used.

In section 32-18-2w5, Royalite Oil Co. No. 30, LSD 11, is below 5,252 feet after getting the cardium sandstone marker at 4,500 feet. West Turner Petroleums No. 1, LSD 2, same section, is below 6,680 feet and getting close to the lime. West Turner No. 2, LSD 7, is below 2,575 feet. West Turner No. 3, LSD 3, will be started in a few weeks, with Grandoro Mines, Ltd., headed by Colonel Victor Spencer of Vancouver, British Columbia, taking a financial interest.

In section 29-18-2w5, Commoil, Ltd., has let contract for its No. 2 well in LSD 10 to Drilling Contractors, Ltd. Location is just south of Commoil No. 1, the largest producer on the west flank. Globe Royalties No. 1, LSD 7, is below 4,868 feet after getting the cardium sandstone at 4,650 feet. Royalite Oil Co. No. 31, LSD 6, is below 1,842 feet. Model-Spooner-Reward No. 2, S half LSD 1, is in sandy shale below 5,368 feet after entering the grit beds at 5,220 feet.

In section 21-18-2w5, Barsac Royalties No. 1, LSD 12, is below 4,467 feet.

In section 20-18-2w5, Consolidated Royalties No. 1, LSD 14, is below 2,931 feet. Intercity Royalties No. 1, which will be known henceforth as Producers Crude Corp. No. 1, LSD 11, same section, is below 1,850 feet. Sunset Oils No. 2, LSD 7, is below 1,756 feet. York Oils No. 1, LSD 2, bottoming at 3,415 feet, is reaming for casing below 2,500 feet. United-Brown Petroleums No. 5, LSD 1, is below 4,575 feet.

In section 17-18-2w5, Coronation Royalties No. 1, LSD 10, is below 3,454 feet. Sundance Royalties No. 1, LSD 9, is below 5,599 feet. Royalite Oil Co. No. 32, LSD 8, west of the Highwood River, is rigged ready to spud.

In section 16-18-2w5, Frontier Royalties No. 1, LSD 11, is below 3,358 feet. Royal Canadian Oil Co. No. 2, LSD 4, is below 240 feet, after setting 21½-inch surface casing at 80 feet. Okalta Oil Co. No. 7, LSD 3, is resuming after running 16-inch casing to 1,400 feet. Okalta No. 8, LSD 6, is below 992 feet.

In section 9-18-2w5, National Petroleum Corp. No. 2, LSD 14, is in the Dalhousie sand below 6,678 feet and is expected to get the Madison limestone around 6,950 feet.

In section 33-17-2w5, Davies Petroleums No. 3, LSD 7, is below 2,000 feet. Davies Petroleums, Ltd., has taken over LSDs 1 and 8, section 29-17-2w5, from W. Fay Becker, for a stock consideration plus 10 per cent royalty.

Okalta Structure

On the Okalta fold, west of the main Turner Valley structure, Okalta Oil Co. No. 6, LSD 3, section 30-18-2w5, is below 5,408 feet. Scottish Petroleums No. 1, LSD 16, section 19-18-2w5, is standing at 700 feet.

North Turner Valley

On the west flank of North Turner Valley, Phillips Royalties No. 1, LSD 16, section 16-20-3w5, is building derrick for rotary outfit from Spy Hill Royalties No. 1, to deepen from 3,735 feet.

In section 33-20-3w5, Home Oil Co. No. 2 Millarville is preparing to start work in LSD 6, with Newell & Chandler handling the drilling contract.

Far South Test

A new farthest south test for Turner Valley is planned by Firth Petroleum, Ltd., of Toronto which has spotted its No. 1 well in LSD 6, section 16-17-2w5. Firth Petroleum holds the south half of this section and the north half of section 9-17-2w5.

New Drilling Planned

The latest survey of Turner Valley west flank operations shows 30 tests actually drilling or partly drilled and likely to be completed, with about 18 additional tests to be started this spring. Among the new tests, Mission Oil Co. No. 1, LSD 16, section 31-18-2w5, will be drilled as Anglo-Canadian Oil Co. No. 1, and a second Anglo-Canadian well will be drilled farther south. Brown Oil Corp. No. 5 has been spotted in LSD 12, section 16-18-2w5, and No. 6 will be started. Davies Petroleums No. 4 has been located in LSD 10, section 32-18-2w5, and is waiting for cable tool outfit from Davies No. 3. Royalite Oil Co. No. 33 has been located in LSD 1, section 17-18-2w5. Producers Crude Corp. which has taken over Intercity Royalties No. 1 in LSD 11, section 20-18-2w5, will start a second test. Marine Petroleums No. 1 will drill in LSD 11, section 9-18-2w5. Alturner Oils No. 1 will drill in LSD 4, same section. Soturn Oils No. 1, NE quarter section 5-18-2w5, is planning to start this spring, and Vantage Oils will drill at least one test.

East Side Drilling

On the Aldersyde structure, east of Turner Valley, Ranchmen's Oil Co. No. 1, LSD 16, section 13-20-29w4, has resumed fishing at 7,230 feet. Anglo-Canadian Oil Co. is sponsoring completion of the test, which has got some good oil shows in a small hole and is believed close to the lime.

Tests in the Foothills

On the Brazeau structure in the northern foothills west of Edmonton, Home Oil Co. No. 1 Brazeau, LSD 16, section 7-43-17w5, is below 2,110 feet.

On the Duncan structure, Spindletop Oils No. 1, LSD 4, section 1-20-6w5, is preparing to resume early in April from 2,315 feet.

On the Moose dome, Moose Oils No. 2, LSD 8, section 29-22-6w5, has been placed on production from a stray sand at 1,553 feet and is hauling considerable 48-gravity crude to Calgary. Some 650 bbls. were hauled the first week. The well failed to flow satisfactorily, but is pumping.

On the Highwood-Sinclair structure southwest of Turner Valley, Green Valley Oils No. 1 Banner, LSD 6, section 34-17-3w5, used acid to loose the tools which are now being fished from 5,797 feet. The acid increased the crude shows in the lime. Samples of crude tested 35 gravity, but the showings are still non-commercial. As soon as the hole is cleared, 6-inch casing will be run and the hole deepened into production.

Farther south in the same area, W. H. Pollard has subleased from Rosedale Oils, Ltd., the SE quarter section 23-16-3w5, with a drilling commitment. Drilling will probably be handled by the P. & H. Development Co. The Rosedale company which holds extensive acreage on the Highwood-Sinclair structure was organized by Chinese of Alberta and British Columbia, the officers being: M. C. Wong, president; Wong Pond, vice president; D. Austin Lane, James W. Townshend, Warren Kemp, John Cuttle, C. Y. George, directors.

Border Fields

In the Taber field, Southern Alberta, Plains Petroleum Corp. No. 4, C LSD 15, section 25-9-17w4, is digging cellar. Plains No. 5, C LSD 2, section 36-9-17w4, has been spotted. Locations are a little east of the previous drilling and higher on structure. Plains No. 3, section 25-9-17w4, which drilled into water after showing considerable crude at the lime contact is preparing for a deep test of the lime below 3,435 feet where casing was cemented.

Plains Petroleum Corp. has started regular shipments of crude to the Imperial Oil refinery at Regina, Saskatchewan. Initial shipment was four carloads, and shipments will continue at two carloads a day till storage is reduced and will then be taken from production of Plains No. 2, LSD 11, section 25-9-17w4. The company is securing the benefit of the new C.P.R. freight rate of 22½ cents a barrel from Taber to Regina, and has its own spur in operation from the lease to the main line. Plains No. 1 discovery well, which developed water after striking crude, will be used as a field water supply with a 2-inch pipe laid from the well.

McIntyre-Lyons No. 1, LSD 14, section 19-3-21w4, on the McIntyre ranch south of Magrath, is below 2,860 feet and expected to reach the potential producing horizon about the middle of April.

Keho Dome Oils, Ltd., has been incorporated under Alberta charter with head office at Calgary to drill in southern Alberta.

East Central Alberta

In the Tibstone field, East Central Alberta, Dina Oil & Refining Co. No. 4, LSD 14, section 9-45-1w4, has cemented casing on top of the sands at 1,690 feet and is preparing to drill in.

In the Wainwright field, Altoba Gas & Exploration Co. No. 1, section 35-47-7w4 is fishing at 1,000 feet. Montreal-Alberta Oil Co. No. 1, LSD 2, section 15-45-7w4, is below 3,505 feet on a deep test of the lime.

British Columbia Test

In the Sage Creek area, southwestern British Columbia, Columbia Oils No. 1 is below 8,028 feet and testing production under supervision of R. Gibson of the Halliburton Cementing Co. The well is located just over the Rocky Mountains, 70 miles from telephone communication and 90 miles from the nearest source of supplies. Communication is maintained

(Continued on Page 226)

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WILDCAT OPERATIONS

CALIFORNIA

IMPORTANT WELLS AND NORTHERN CALIFORNIA WILDCATS

Company, well and location—	S.T.R.	Depth	Status
Wilshire Oil, No. 1 Gaviota, Santa Barbara	35- 5-33	3,000	br. sh. drlg.
Hancock-Bush, No. 3 Brown, Santa Maria, Santa Barb.	25-10-34	4,373	sd. sh. drlg.
Palm Oil, No. 1 Bill, Santa Maria, Santa Barbara	27-10-34	3,497	sd. sh. drlg.
Cal. Lands Inc., No. 3 Gallison, Santa Maria, S. Barb.	26-10-34	5,515	rig to pump
Cal. Lands Inc., No. 4 Gallison, Santa Maria, S. Barb.	26-10-34	1,972	sd. sh. drlg.
Cal Lands, No. 1 MacDonald, Santa Maria, S. Barb.	28-10-34	2,360	sd. sh. drlg.
E. H. Moore, No. 1-H Sugar, Santa Maria, Santa Barb.	19-10-34	4,281	sd. sh. drlg.
Pet. Sec., No. 1 Carey, Santa Maria, Santa Barbara	27-10-34	5,148	sd. sh. drlg.
Signal Oil, No. 3 Romalho, Santa Maria, S. Barbara	27-10-34	4,518	cmtd. 4,508
Union Oil., No. 1-19 Enos, Santa Maria, S. Barbara	19-10-33	2,796	will deepen
Union Oil, No. 3 Le Roy, Santa Maria, Santa Barbara	24-10-35	758	sd. sh. drlg.
Union Oil, No. 2-1-0 Santa Maria, Santa Barbara	21-10-34	5,000	sd. sh. drlg.
Union Oil, No. 1 Silva, Santa Maria, Santa Barbara	24-10-35	2,998	sd. sh. drlg.
Union Oil, No. 20 Squires, Orcutt, Santa Barbara	27- 9-34	4,240	pump 190 b.d.
Pet. Equities, No. 1 Webber, Santa Maria, S. Barbara	27-10-34	4,039	cmtd. 4,032
Wilson Oil, No. 1-B Santa Maria, Santa Barbara	26-10-34	4,398	sd. sh. drlg.
York Oil, No. 2 Doane, Santa Maria, Santa Barbara	27-10-34	4,571	flow 1,400 b.d.
Bay City Oil, No. 1-M Santa Maria, Santa Barbara	27-10-34	3,378	sd. sh. drlg.
F. E. Jones, No. 1 Wisconsin, Santa Maria, S. Barbara	27-10-34	4,600	pump 300 b.d.
Pac. West. Oil, No. 3-S Santa Maria, Santa Barbara	27-10-34	4,465	sd. sh. drlg.
Pima Drlg., No. 1 Morganti, Casmalia, Santa Barbara	13- 9-35	1,777	pump water
Standard Oil, No. 1 Cat Canyon, Santa Barbara	27- 9-33	5,529	redrlg. 2,340
A. E. Bell, No. 4 York, Lompoc, Santa Barbara	33- 8-34	3,178	P.B. 2,760
Moyle Pet., No. 1 Gato Ridge, Santa Barbara	9- 8-32	3,792	pump 500 b.d.
Carpinteria Oil, No. 1 Carpinteria, Santa Barbara	32- 4-25	1,845	sd. sh. drlg.
Gauthier Oil, No. 1 Summerland, Santa Barbara	22- 4-26	1,404	sd. sh. drlg.
W. G. Rowe, No. 1 Johnson, Oxnard, Ventura	15- 1-22	4,115	cleaning out
High Mesa Oil, No. 1 Butcher, Ojai, Ventura	16- 4-22	1,330	idle
Texas Co., No. 5 Yale, South Mountain, Ventura	13- 3-21	2,770	sd. sh. drlg.
Texas Co., No. 1 Edwards, Camarillo, Ventura	19- 2-21	6,111	fish D.P.
C. C. M. Oil, No. 19 Hobson, Rincon, Ventura	17- 3-24	3,730	br. sh. drlg.
C. C. M. Oil, No. 20 Hobson, Rincon, Ventura	8- 3-24	4,375	test W.S.O.
C. C. M. Oil, No. 22 Hobson, Rincon, Ventura	17- 3-24	1,997	sd. sh. drlg.
Richfield Oil, No. 6-F Rincon, Ventura	17- 3-24	3,230	redrlg. 2,580
General Pet., No. 3 Ferguson, Rincon, Ventura	8- 3-24	3,117	pump 144 b.d.
Tide Water A. O., No. 19 V.L.W., Ventura, Ventura	26- 3-23	7,396	hd. sd. drlg.
Tide Water A. O., No. 41 V.L.W., Ventura, Ventura	24- 3-23	7,305	flow 1,274 b.d.
Tide Water A. O., No. 68 Lloyd, Ventura, Ventura	27- 3-23	3,286	sd. sh. drlg.
Tide Water A. O., No. 69 Lloyd, Ventura, Ventura	27- 3-23	7,197	sd. sh. drlg.
Tide Water A. O., No. 135 Lloyd, Ventura, Ventura	27- 3-23	9,630	flow 230 b.d.
Tide Water A. O., No. 138 Lloyd, Ventura, Ventura	23- 3-23	9,340	O.S. drlg.
Tide Water A. O., No. 18 Hartman, Ventura, Ventura	22- 3-23	10,399	sd. sh. drlg.
Tide Water A. O., No. 11 McGonigle, Ventura, Ventura	23- 3-23	1,283	sd. sh. drlg.
Shell Oil, No. 65 Taylor, Ventura Ave., Ventura	30- 3-23	5,920	P.B. 5,582
Shell Oil, No. 94 Taylor, Ventura Ave., Ventura	20- 3-33	2,197	sd. sh. drlg.
General Pet., No. 13 Notten, Ventura Ave., Ventura	28- 3-23	9,871	P.B. 9,451
Amerada Pet., No. 5 Beer, Devils Den, Kern	22-26-19	7,068	sd. sh. drlg.
Gibson Oil, No. 3 Alferitz, Devils Den, Kern	14-25-18	147	sd. sh. drlg.
Par-Mer Oil, No. 1 McKittrick, Kern	6-31-22	2,392	sd. sh. drlg.
Rocima Oil, No. 1 Laymance, McKittrick, Kern	20-30-22	1,427	pumping test
John W. Austin, No. 1 Hampshire, McKittrick, Kern	26-30-22	980	bailing
Standard Oil, No. 2 Randolph, Semi-Tropic, Kern	14-27-23	7,620	flow 100 b.d.
Continental Oil, No. 2 KCL, Wasco, Kern	8-27-24	14,579	sd. sh. drlg.
Chico-Martinez Oil, No. 1 South Belridge, Kern	1-29-20	1,050	bailing
Ohio Oil, No. 1 Ford, South Belridge, Kern	6-29-22	3,076	sd. sh. drlg.
Texas Co., No. 2-23 Theta, Lost Hills, Kern	2-26-20	1,825	P.B. 1,684
Standard Oil, No. 7 United, Lost Hills, Kern	2-26-20	1,553	sd. sh. drlg.
Tide Water A. O., No. 10-B Williamson, L. Hills, Kern	11-26-20	1,340	sd. sh. drlg.
Argo Pet., No. 1 Farnsworth, Lost Hills, Kern	11-26-20	1,291	pump 80 b.d.
Shell Oil, No. 1 Voight, Belridge, Kern	32-27-20	2,687	sd. sh. drlg.
Belridge Oil, No. 27-6 North Belridge, Kern	27-27-20	5,294	sd. sh. drlg.
Belridge Oil, No. 27-7 North Belridge, Kern	27-27-20	8,466	flow 540 b.d.
Belridge Oil, No. 35-26 North Belridge, Kern	35-27-20	4,697	sd. sh. drlg.
Tide Water A. O., No. 1-21 North Belridge, Kern	21-27-20	8,640	swabbing
Tide Water A. O., No. 3-21 North Belridge, Kern	21-27-20	2,450	sd. sh. drlg.
Richfield Oil, No. 1-A North Belridge, Kern	22-27-20	8,119	br. sh. drlg.
Richfield Oil, No. 2 North Belridge, Kern	22-27-20	3,678	sd. sh. drlg.
Texas Co., No. 3 Martin, North Belridge, Kern	22-27-20	7,197	br. sh. drlg.
General Pet., No. 1 St. Helens, Belridge, Kern	12-28-20	8,490	hd. sd. drlg.
Coast Expl., No. 1 Coffee, Round Mountain, Kern	6-28-29	1,982	O.S. drlg.
Cal-Western Oil, No. 11, Round Mountain, Kern	12-28-28	1,574	sd. sh. drlg.
Harry Long, No. 2 Willis, Round Mountain, Kern	2-28-28	1,970	sd. sh. drlg.
Shell Oil, No. 5-1 Olcese, Round Mountain, Kern	22-28-29	1,764	sd. sh. drlg.
Kern River Oilfields, No. 25-1-C Kern Front, Kern	25-28-27	2,007	P.B 1,794
A. B. Rubenstein, No. 1 Lerdo, Kern	20-28-27	3,369	P.B. 3,271
Helm & Smith, No. 2-A Kernco, Kern River, Kern	34-28-28	515	sd. sh. drlg.
J. P. Carter, No. 2 S.P.L., Mount Poso, Kern	3-27-28	1,473	pump water
Bargol Oil, No. 2 Claflin, Mount Poso, Kern	10-27-27	2,065	sd. sh. drlg.
Framac Oil, No. 3 Brown, Mount Poso, Kern	22-27-27	1,351	reaming
Crestmont Oil, No. 1 Glide, Mount Poso, Kern	19-26-28	148	sd. sh. drlg.
Ring Oil, No. 6 Bowles, Mount Poso, Kern	29-26-28	1,785	pump 200 b.d.
Western Gulf Oil, No. 33 KCL, Fruitvale, Kern	22-29-27	3,872	pump 100 b.d.
Wood Callahan Oil, No. 21-2 Edison, Kern	21-30-29	3,675	P.B. 3,285
Wood Callahan Oil, No. 1 Porter, Edison, Kern	20-30-29	4,064	sd. sh. drlg.
Union Oil, No. 1 Berry, Arvin, Kern	15-31-29	5,442	sd. sh. drlg.
Superior Oil, No. 2 Wagner, Rio Bravo, Kern	35-28-25	10,880	br. sh. drlg.
Superior Oil, No. 1 Geissinger, Rio Bravo, Kern	32-28-25	11,248	sd. sh. drlg.
Superior Oil, No. 1 Ruhl, Rio Bravo, Kern	1-29-25	11,080	sd. sh. drlg.
Union Oil, No. 2-34 KCL, Rio Bravo, Kern	34-28-25	11,205	cmtd. 11,200
Getty Oil, No. 1 Ramsey, Rio Bravo, Kern	35-28-25	9,590	sd. sh. drlg.
General Pet., No. 1 Wagoner, Rio Bravo, Kern	35-28-25	9,467	sd. sh. drlg.
General Pet., No. 2 Wagoner, Rio Bravo, Kern	35-28-25	1,594	sd. sh. drlg.
Standard Oil, No. 18-1 KCL, Una, Kern	29-28-26	5,494	sd. sh. drlg.
Shell Oil, No. 58-A KCL, Bellevue, Kern	29-29-27	6,398	gr. sd. drlg.
Continental Oil, No. 1-D KCL, Greeley, Kern	10-30-26	8,415	gr. sd. drlg.
Superior Oil, No. 9 KCL, Greeley, Kern	3-30-26	7,870	dry; abd.
Standard Oil, No. 1 Calder Klassen, Greeley, Kern	20-29-26	7,750	flow 1,040 b.d.
Standard Oil, No. 2 Fleishauer, Greeley, Kern	20-29-26	8,050	gr. sd. drlg.
Standard Oil, No. 11-2 KCL, Greeley, Kern	20-29-26	10,360	gr. sd. drlg.
Standard Oil, No. 11-12 KCL, Greeley, Kern	20-29-26	8,023	dry; abd.
Standard Oil, No. 11-13 KCL, Greeley, Kern	20-29-26	7,739	O.S. drlg.
Standard Oil, No. 11-14 KCL, Greeley, Kern	18-29-26	5,271	sd. sh. drlg.
Standard Oil, No. 12-4 KCL, Greeley, Kern	16-29-26	8,253	dry; abd.
Standard Oil Co. No. 1 Ross, Greeley, Kern	20-29-26	3,087	sd. sh. drlg.
Shell Oil, No. 76-1-B KCL, Greeley, Kern	16-29-26	5,972	sd. sh. drlg.
Shell Oil, No. 8-29-A KCL, Ten Section, Kern	29-30-26	8,220	flow 3,270 b.d.
Shell Oil, No 41-29-A KCL, Ten Section, Kern	29-30-26	6,775	sd. sh. drlg.
Shell Oil, No 25-30-B KCL, Ten Section, Kern	30-30-26	4,961	sd. sh. drlg.
Shell Oil, No 8-31-B KCL, Ten Section, Kern	31-20-26	7,865	sd. sh. drlg.
Shell Oil, No 2-13-A KCL, Canal, Kern	13-30-25	7,380	sd. sh. drlg.
Shell Oil, No 81-14-A KCL, Canal, Kern	14-30-25	1,697	sd. sh. drlg.
Ohio Oil, No. 5-E Canal, Kern	14-30-25	7,650	sd. sh. drlg.
Ohio Oil, No. 8-A KCL, Buena Vista Lake, Kern	32-31-26	8,850	sd. sh. drlg.
Richfield Oil, No. 1 M.C., Midway-Sunset, Kern	24-31-22	2,560	bailing
C. C. M. Oil, No. 4 Tumbador, Midway-Sunset, Kern	24-31-22	2,430	bailing
Berry Oil, No. 22, Midway-Sunset, Kern	28-12-24	1,053	O.S. drlg.
Standard Oil, No. 35-23-D, Midway-Sunset, Kern	23-32-24	3,500	pump 425 b.d.
Victor Oil No. 14, Midway-Sunset, Kern	35-32-23	3,320	br. sh. drlg.
National Oil, No. 17 Midway-Sunset, Kern	35-32-23	2,115	O.S. drlg.
Texas Co., No. 1 Pioneer, Midway-Sunset, Kern	33-11-23	7,680	br. sh. drlg.
F. E. Abbott, No. 12 Lewis, Sunset, Kern	20-11-23	2,650	deepened
Universal Cons'd., No. 1 Tejon, Kern	33-11-19	4,634	will P.B.
Shell Oil, No. 4-26 KCL, San Emidio, Kern	26-11-22	7,770	sd. sh. drlg.
Pure Oil, No. 1 SPL, Cantua, Fresno	31-18-18	10,875	br. sh. drlg.
Superior Oil, No. C.U.P., Fresno	20-16-13	6,001	dry; abd.
Jacalitos Oil, No. 1 Jacalitos, Fresno	14-21-15	5,870	idle
Pet. Sec., No. 2 Gatchell, Jacalitos, Fresno	18-20-16	6,675	gr. sh. drlg.
Shell Oil, No. 36-1 Italo, Coalinga, Fresno	36-19-14	3,196	sd. sh. drlg.
Shell Oil Co., No. 35-1 Coalinga, Fresno	35-20-14	963	sd. sh. drlg.
K. N. D. A., No. 67-20-J Kettleman North, Fresno	20-21-17	10,050	hd. sd. drlg.
K. N. D. A., No. 72-4-P Kettleman North, Fresno	4-22-17	8,420	hd. sh. drlg.
K. N. D. A., No. 6-6-Q Kettleman North, Kings	6-22-18	8,199	compressor
K. N. D. A., No. 6-8-Q Kettleman North, Kings	8-22-18	6,797	br. sh. drlg.
K. N. D. A., No. 43-20-Q Kettleman North, Kings	8-22-18	6,160	br. sh. drlg.
K. N. D. A., No. 58-16-Q Kettleman North, Kings	16-22-18	5,587	hd. sh. drlg.
K. N. D. A., No. 47-18-Q Kettleman North, Kings	18-22-18	7,020	gr. sd. drlg.

KEY TO ABBREVIATIONS USED IN DRILLING REPORTS

Abd., abandoned.
Acd., acidized.
B.O., barrels of oil.
B.P.D., barrels per day.
B.D., barrels daily.
B.P., back pressure.
B.R., building rig.
Br. sh., brown shale.
B.S., basic sediment.
Cd. or Crd., cored.
C.D., corrected depth.
Cg., coring.
Cmtd., cemented.
C.O., cleaning out.
Comp., completed.
Compr., compressor.
C.P., casing pressure, also cement through perforations.
Csg., casing.
D.D., drilling (or drilled) deeper.
Drlg. or Drg., drilling.
Drk. or Dk., derrick.
D.S., drill stem.
D.&A., dry and abandoned.
Fsg., fishing.
Gbo., gumbo.
G.I., gas injection.
Gr., gravity.
Gr. sd., gray sand.
Grn. sh., green shale.
Hd. sd., hard sand.
H.F.W., hole full of water.
I.P., initial production.
L., lime.
L.D.D., later drilled deeper.
Lnr., liner.
Loc., location.
M.I.M., moving in material.
M.I.R., moving in rig.
M.I.R.T., moving in rotary tools.
M.O.T., milling on tools.
O.I.H., oil in hole.
O.S., oil sand.
O.T.D., old total depth.
O.W.D.D., old well drilling deeper.
O.W.P.B., old well plugging back.
P.B., plugging or plugged back.
P.B.P., pulling or pulled big pipe.
P.L., pipe line.
P.L.O., pipe line oil.
Pmpg., pumping.
P.O.P., putting on pump.
P.P., pulled pipe.
Rd. sd., red sand.
Rd. sh., red shale.
Recmt., recemented.
Rmg., reaming.
Redrlg., redrilling.
Rng., running.
R.O.G., rig on ground.
R.P., rock pressure.
R.U., rigging up.
R.U.R., rigging up rotary.
R.U.S.T., rigging up standard tools.
R.&T., rods and tubing.
S. or Sd., sand.
S.D., shut down.
Sdy. sh., sandy shale.
Sdtr., or St. sidetracking.
S.D.P.L., shut down for pipe line.
S.D.O., or S.D.W.O., shut down awaiting orders.
S.G., show gas.
Sh.&L., shale and lime.
S.I., shut in.
S.I.P., shut in, prorated.
S.L.M., steel line measurement.
S.O., show oil.
S.O.G.&W., show of oil, gas and water.
Spdg. or Spd., spudding.
S.R., straightreaming.
Stdg., standardizing (also standing).
S.W., salt water.
Swbg., swabbing.
T.A., temporarily abandoned.
Tbg., tubing.
T.D., total depth.
T.P., tubing pressure.
Tr., tract.
U.R., underreaming.
W.I.H., water in hole.
W.O., workover.
W.O.C. or W.O.C.S., waiting for cement to set.
W.P., working pressure.
W.S.O., water shutoff.
W.S.S.O.K., water shutoff O.K.
W.S.O.N.G., water shutoff no good.
W.S.R. or W.O.S.R., awaiting standard rig.
Wtr., water.

K. N. D. A., No. 43-20-Q Kettleman North, Kings	20-22-18	2,992	sd. sh. drlg.
Standard Oil, No. 27-21-J Kettleman North, Fresno	21-21-17	10,735	Avenal zone
Standard Oil, No. 58-33-J Kettleman North, Fresno	33-21-17	6,795	br. sh. drlg.
Standard Oil, No. 2-11-P Kettleman North, Kings	11-22-17	7,850	will suspend
Standard Oil, No. 87-1-P Kettleman North, Kings	1-22-17	6,994	sd. sh. drlg.
Standard Oil, No. 21-13-P Kettleman North, Kings	13-22-17	7,284	br. sh. drlg.
Standard Oil, No. 41-7-Q Kettleman North, Kings	7-22-18	7,772	gr. sd. drlg.
Standard Oil, No. 74-7-Q Kettleman North, Kings	7-22-18	3,880	sd. sh. drlg.
Standard Oil, No. 85-7-Q Kettleman North, Kings	7-22-18	6,197	sd. sh. drlg.
Bandini Pet., No. 5 Whepley, Kettleman N., Fresno	35-21-17	9,515	hole crooked
Pyramid Prod., No. 1 Kettleman Plains, Kings	27-24-18	4,088	sd. sh. drlg.
Standard Oil, No. 2 Weyl, McDonald Island, S. Joaquin	25- 2- 4	5,279	flow gas
L. E. Turner, No. 1 Glaze, Pixley, Tulare	15-22-26	2,802	cmtd.
Wilshire Oil, No. 1 Cowell, Half Moon Bay, San Mateo	20- 6- 5	8,030	will P.B.
Amerada Pet., No. 1 Mayhood, Rio Vista, Solano	36- 4- 2	3,186	sd. sh. drlg.

IMPORTANT WELLS AND SOUTHERN CALIFORNIA WILDCATS

Company, well and location—	S.T.R.	Depth	Status
Sovereign Oil, No. 1 El Segundo, Los Angeles	12- 3-15	7,347	cmtd. 7,042
Termo Co., No. 2 El Segundo, Los Angeles	12- 3-15	7,400	rig compressor
Wilshire Oil, No. 1 Const., El Segundo, Los Angeles	12- 3-15	7,408	dry; abd.
Rolling Hills Pet., No. 1 Palos Verdes, Los Angeles	27- 2-14	4,218	idle
C. B. Patton, No. 1 Meacham, Torrance, Los Angeles	15- 4-14	5,032	P.B. 4,997
C. B. Patton, No. 2 Neill, Torrance, Los Angeles	14- 4-14	4,196	sd. sh. drlg.
W. E. McCaslin, No. 2 Torrance, Los Angeles	14- 4-14	5,014	sd. sh. drlg.
Torrance Oil, No. 1 Grubb, Torrance, Los Angeles	14- 4-14	3,673	cleaning out
Sol Oil, No. 1 Torrance, Torrance, Los Angeles	23- 4-14	3,825	redrlg. 2,985
W. P. Andrews, No. 5 Kirk, Torrance, Los Angeles	14- 4-14	3,788	fish liner
N. H. Anderson, No. 2 Torrance, Los Angeles	14- 4-14	5,051	pump 95 b.d.
McDonald & Burns, No. 3 Moore, Torrance, L. Ang.	14- 4-14	3,430	will redrl.
Emerald Oil, No. 1 fee, Torrance, Los Angeles	23- 4-14	5,120	will P.B.
C. W. Camp, No. 12 Torrance, Los Angeles	23- 4-14	3,780	rigging up
Doyle Pet., No. 1 Bond, Torrance, Los Angeles	23- 4-14	5,057	sd. sh. drlg.
Doyle Pet., No. 2 Neill, Torrance, Los Angeles	14- 4-14	4,999	sd. sh. drlg.
Doyle Pet., No. 3 Getty, Torrance, Los Angeles	14- 4-14	3,780	cleaning out
Elyod Oil, No. 1 Post, Torrance, Los Angeles	14- 4-14	3,774	P.B. 3,720
Peso Oil, No. 1 Marcoux, Torrance, Los Angeles	23- 4-14	3,782	mill 3,060
F. C. Kelly, No. 1 Huyck, Torrance, Los Angeles	14- 4-14	3,762	rigging up
Williams & Co., No. 1 Torrance, Los Angeles	14- 4-14	3,795	redrlg. 2,460
Woolner Oil, No. 1 Torrance, Los Angeles	14- 4-14	3,780	rigging up
Krause & Baker, No. 2 Gladys, Torrance, Los Angeles	14- 4-14	3,795	rigging up
Pilgrim Oil, No. 1 P. & O., Torrance, Los Angeles	14- 4-14	3,800	redrlg. 3,596
Sierra Dev., No. 2 Weiller, Torrance, Los Angeles	14- 4-14	3,560	will deepen
Pilgrim Oil, No. 2 Getty, Torrance, Los Angeles	23- 4-14	3,780	cleaning out
Texas Co., No. 5 Redondo, Torrance, Los Angeles	15- 4-14	3,797	sd. sh. drlg.
Texas Co., No. 3 Wilson, Torrance, Los Angeles	15- 4-14	4,791	sd. sh. drlg.
R. K. Wilson, No. 1 Cook, Torrance, Los Angeles	14- 4-14	3,770	cleaning out
South. Cal. Drlg., No. 1 Hough, Torrance, Los Angeles	14- 4-14	3,780	will deepen
Standard Oil, No. 1 Martin, Torrance, Los Angeles	5- 4-14	3,759	will deepen
Superior Oil, No. 5 Torrance, Los Angeles	16- 4-14	4,959	sd. sh. drlg.
Imperial Gypsum, No. 1-C Torrance, Los Angeles	14- 4-14	3,750	cleaning out
Lakeside Oil, No. 1 Cook, Torrance, Los Angeles	14- 4-14	4,998	sd. sh. drlg.
Coast Line Oil, No. 1 McBride, Torrance, Los Angeles	14- 4-14	4,990	sd. sh. drlg.
C. C. M. O., No. 14 Torrance, Los Angeles	14- 4-14	4,190	hd. sh. drlg.
C. C. M. O., No. 23 Torrance, Los Angeles	16- 4-14	3,770	P.B. 3,530
N. Fisher, No. 1 Watkins, Torrance, Los Angeles	23- 4-14	5,150	pump 50 b.d.
N. Fisher, No. 1 Washburn, Torrance, Los Angeles	23- 4-14	5,147	rig to pump
Berken Oil, No. 1 Star, Torrance, Los Angeles	16- 4-14	3,758	rigged up
Shell Oil, No. 94 Rever, Dominguez, Los Angeles	33- 3-13	4,365	sd. sh. drlg.
Union Oil, No. 58 Callender, Dominguez, Los Angeles	33- 3-13	6,890	sd. sh. drlg.
Union Oil, No. 59 Callender, Dominguez, Los Angeles	33- 3-13	6,397	sd. sh. drlg.
Union Oil, No. 60 Callender, Dominguez, Los Angeles	33- 3-13	6,480	sd. sh. drlg.
Barnsdall Oil, No. 20 O'Dea, Rosecrans, Los Angeles	18- 3-13	6,791	sd. sh. drlg.
Union Oil, No. 18-R Rosecrans, Los Angeles	18- 3-13	7,630	flow 1,071 b.d.
Universal Consd'd, No. 2 Trust, Rosecrane, Los Ang.	18- 3-13	7,260	sd. sh. drlg.
J. Woodward, No. 1 Gordon, Rosecrans, Los Angeles	18- 3-13	6,596	will deepen
Barnsdall Oil, No. 3 S. F. Newhall, Los Angeles	26- 4-17	976	sd. sh. drlg.
General Pet., No. 33 Ford, Wilmington, Los Angeles	4- 5-13	1,941	sd. sh. drlg.
General Pet., No. 36 Ford, Wilmington, Los Angeles	4- 5-13	3,000	O.S. drlg.
General Pet., No. 39 Ford, Wilmington, Los Angeles	4- 5-13	4,101	O.S. drlg.
General Pet., No. 3-1 C.C., Wilmington, Los Angeles	4- 5-13	3,165	O.S. drlg.
General Pet., No. 10 Harbor, Wilmington, Los Angeles	2- 5-13	2,181	sd. sh. drlg.
General Pet., No. 11 Harbor, Wilmington, Los Angeles	2- 5-13	1,677	sd. sh. drlg.
General Pet., No. 15 Harbar, Wilmington, Los Angeles	2- 5-13	2,475	sd. sh. drlg.
General Pet., No. 4-S.P., Wilmington, Los Angeles	2- 5-13	4,000	flow 2,200 b.d.
Allied Pet., No. 27 Wilmington, Los Angeles	2- 5-13	2,991	sd. sh. drlg.
Bankline Oil, No. 3-U.P., Wilmington, Los Angeles	3- 5-13	3,158	O.S. drlg.
Bankline Oil, No. 6-U.P., Wilmington, Los Angeles	2- 5-13	2,460	sd. sh. drlg.
Baker Oil, No. 1 Wilmington, Los Angeles	35- 4-13	3,078	cmtd. 3,077
Caminol Co., No. 2-7-H Wilmington, Los Angeles	2- 5-13	2,980	flow 375 b.d.
Dunlap Oil No. 11 Wilmington, Los Angeles	2- 5-13	2,460	sd. sh. drlg.
Hogan Pet., No. 1 Graham, Wilmington, Los Angeles	2- 5-13	2,945	O.S. drlg.
Hancock Oil, No. 3-A Wilmington, Los Angeles	2- 5-13	4,045	flow 4,500 b.d.
Hancock Oil, No. 5-A Wilmington, Los Angeles	3- 5-13	3,861	O.S. drlg.
Hancock Oil, No. 9-B Wilmington, Los Angeles	2- 5-13	2,197	sd. sh. drlg.
Hancock Oil, No. 8-F Wilmington, Los Angeles	2- 5-13	1,982	sd. sh. drlg.
Kreiger Oil, No. 2 K. W. Wilmington, Los Angeles	32- 4-13	2,984	sd. sh. drlg.
Gus Pongratz, No. 2-G Wilmington, Los Angeles	32- 4-13	3,646	flow 250 b.d.
Richfield Oil, No. 1-G Wilmington, Los Angeles	2- 5-13	6,078	P.B. 2,970
Richfield Oil, No. 2-R.O., Wilmington, Los Angeles	2- 5-13	3,026	flow 220 b.d.
Richfield Oil, No. 1-P.G., Wilmington, Los Angeles	2- 5-13	2,010	sd. sh. drlg.
Richfield Oil, No. 4-P.G., Wilmington, Los Angeles	2- 5-13	2,683	sd. sh. drlg.
Richfield Oil, No. 1-W.E., Wilmington, Los Angeles	2- 5-13	3,076	sd. sh. drlg.
Royalty Service, No. 6 Nelson, Wilmington, Los Ang.	33- 4-13	4,687	sd. sh. drlg.
Superior Oil, No. 1 Seaside, Wilmington, Los Angeles	4- 5-13	2,675	O.S. drlg.
Superior Oil, No. 2 B.B., Wilmington, Los Angeles	4- 5-13	2,995	flow 275 b.d.
Superior Oil, No. 3 B.B., Wilmington, Los Angeles	4- 5-13	2,875	flow 390 b.d.
Superior Oil, No. 2 Ocean Front, Wilmington, Los A.	2- 5-13	2,651	O.S. drlg.
Texas Co., No. 2 Ref., Wilmington, Los Angeles	32- 4-13	3,472	flow 186 b.d.
Termo Co., No. 1-D Wilmington, Los Angeles	3- 5-13	3,462	O.S. drlg.
Termo Co., No. 2-D Wilmington, Los Angeles	3- 5-13	3,835	O.S. drlg.
Union Pacific R.R., No. 50 Wilmington, Los Angeles	34- 4-13	2,611	sd. sh. drlg.
Union Pacific R.R., No. 51 Wilmington, Los Angeles	34- 4-13	3,986	flow 6,300 b.d.
Union Pacific R.R., No. 70 Wilmington, Los Angeles	34- 4-13	4,025	O.S. drlg.
Union Pacific R.R., No. 71 Wilmington, Los Angeles	34- 4-13	4,045	O.S. drlg.
Union Pacific R.R., No. 72 Wilmington, Los Angeles	34- 4-13	3,984	O.S. drlg.
Union Pacific R.R., No. 83 Wilmington, Los Angeles	3- 5-13	2,470	sd. sh. drlg.
Universal Cons'd., No. 2 Newport, Wilmington, L.A.	2- 5-13	4,125	flow 3,200 b.d.
Johnston Drlg., No. 1 Pico, Montebello, Los Angeles	5- 2-11	4,161	sd. sh. drlg.
St. Helens Pet., No. 24-M, Montebello, Los Angeles	2- 2-12	5,498	sd. sh. drlg.
St. Helens Pet., No. 25-M, Montebello, Los Angeles	2- 2-12	4,290	sd. sh. drlg.
Union Oil, No. 1 Paul Howard, Montebello, Los Ang.	2- 2-12	4,597	sd. sh. drlg.
McVicar & Rood, No. 1 Manz, Montebello, Los Ang.	2- 2-12	3,729	cleaning out
Fullerton Oil, No. 5 Whittier, Los Angeles	25- 2-11	287	sd. sh. drlg.
Hilldon Oil, No. 2 North Long Beach, Los Angeles	13- 4-13	4,181	pump 618 b.d.
Signal Oil, No. 1 P.E., North Long Beach, Los Angeles	13- 4-13	1,985	cleaning out
John Abrahams, No. 1 Flood Control, Los Angeles	13- 4-13	4,644	testing
Kramildon Oil, No. 1 Long Beach, Los Angeles	13- 4-13	5,470	sd. sh. drlg.
Marvell Oil, No. 1 Long Beach, Los Angeles	19- 4-12	2,985	sd. sh. drlg.
Dunlap Oil, No. 13 Long Beach, Los Angeles	19- 4-12	2,192	sd. sh. drlg.
Shell Oil, No. 1 Goddard, Long Beach, Los Angeles	19- 4-12	3,520	C.P. 2,850
Richfield Oil, No. 4-B Long Beach, Los Angeles	13- 4-13	4,225	flow 576 b.d.
C. F. Yunker, No. 2 Barbara, Long Beach, Los Angeles	19- 4-12	3,596	sd. sh. drlg.
Union Oil, No. 100 Santa Fe Springs, Los Angeles	6- 3-11	9,945	flow O.&W.
W. P. R. Oil, No. 3 Huntington, Orange	35- 5-11	7,410	P.B. 6,900
Brea Canyon Oil, No. 48 Brea Canyon, Orange	2- 3-10	1,897	sd. sh. drlg.
Standard Oil, No. 127 Murphy, West Coyote, Orange	18- 3-10	3,240	cmtd. 3,224
Standard Oil, No. 2 Bastanchury, W. Coyote, Orange	21- 3-10	4,497	sd. sh. drlg.
Standard Oil, No. 65 Emery, West Coyote, Orange	24- 3-11	2,073	hd. sd. drlg.
Standard Oil, No. 2-12 Coyote, East Coyote, Orange	22- 3-10	3,850	sd. sh. drlg.
Bartholomae Oil, No. 6 Sterns, East Coyote, Orange	22- 3-11	2,173	sd. sh. drlg.
Standard Oil, No. 2-26 Kraemer, Richfield, Orange	32- 3- 9	4,550	pump 173 b.d.
Oliver & Owen, No. 1 Anderson, Yorba, Orange	22- 3- 9	1,330	hd. sd. drlg.
Beth Pet., No. 1 Pickering, Yorba, Orange	22- 3- 9	2,311	pump 75 b.d.
Beverly Hills Pet., No. 1 Fricke, Yorba, Orange	21- 3- 9	1,914	will deepen
Brown & Co., No. 1 Hurley, Yorba, Orange	22- 3- 9	1,823	P.B. 1,800
Burmah Oil, No. 1 Sloan, Yorba, Orange	21- 3- 9	967	sd. sh. drlg.
Signal Oil, No. 1 Kraemer, Yorba, Orange	21- 3- 9	1,947	will deepen

KANSAS

Week Ending March 26 (Descriptions are East unless marked otherwise)

Barber County

Carter Oil Co. et al No. 1 Ely, C NE NW sec. 6-32-14w. Drlg. 4,907 ft.
Palmer Oil Corp. et al No. 1 Warwick. C NW sec. 29-31-10w. R.U.S.T. 4,787 ft.

Barton County

Crown Oil Co. No. 1 Schartz, NW sec. 7-20-11w. Drlg. 2,894 ft.
R. E. Day et al No. 1 Feits, SE SE NE sec. 14-16-12w. S.D. 1,875 ft.
Gear and Atlantic Ref. Co. No. 1 Sullivan, NE SE SW sec. 29-17-13w. Drlg. 1,925 ft.
Murfin et al No. No. 1 Rexroot, NW SE sec. 14-17-13w. Drlg. 900 ft.
C. L. Price No. 1 Hammeke, NE NE SW sec. 12-18-12w. Sil. 3,415-27 ft.; T.D. 3,433 ft.; P.B. 3,429 ft.; est. 20 B.O. P.D. and 2 B.W.
Price et al No. 1 Wondra, NW NE sec. 10-17-13w. Drlg. 1,725 ft.
Sinclair Prairie Oil Co. No. 1 Frederick, SW SW SE sec. 16-16-11w. Arb. 3,322 ft.; T.D. 3,346 ft.; rng. 5-in. csg.

Butler County

T. S. Dustin No. 1 Miley, SE NW NE sec. 17-27-5e. S.D. 810 ft.
Saco Oil Co. et al No. 1 Pettit, SW NW SW sec. 21-28-6. Fsg. 1,700 ft.

Chase County

T. D. Duffy No. 1 Leedy, NE NW NW sec. 26-22-9. U.R. 10-in. 1,575 ft.

Cowley County

Bess & Gralapp et al No. 1 Hunt, CNL NE NW sec. 18-34-5e. Drlg. 1,260 ft.
Arthur Brewer No. 1 Clark, NE SE NW sec. 6-31-4. Bvlle. 2,860-70 ft.; T.D. 2,874 ft.; pot. 116 B.O.; comp.
Arthur Brewer No. 1 McDaniels, SW cor. sec. 24-30-4e. Drlg. 1,650 ft.
Smith et al No. 1 Wilson, SE SW NW sec. 9-33-6. Drlg. 400 ft.
Earl Wakefield No. 1 White, NW NE sec. 4-33-4e. U.R. 8-in. 2,270 ft.

Dickinson County

Fred Franks et al No. 1 Huffman, NW NW sec. 11-13-1e. Rig.

Ellis County

Carter Oil Co. No. 1 Foster, SE NW sec. 1-15-16w. Lost circ. 3,412 ft.
Colonial Oil Co., Trott et al No. 1 Hadley, SE NE SE sec. 12-11-8w. T.D. 3,146 ft.; drld. plug; 2,650 W.I.H. and S.S.O.
Hays & Sackrider No. 1 Windholtz, NE cor. sec. 2-13-16w. T.D. 3,242 ft.; pot. 1,236 B.O.
Twin Drlg. Co. et al No. 1 Hall, NW SW NE sec. 1-12-17w. Drlg. 3,397 ft.
Western Kansas O. & R. Co. et al No. 1 Cole, NE SE SE sec. 24-11-20w. Drlg. 1,960 ft.

Ellsworth County

Ralph Wixson et al No. 1 Peterman, SW cor. sec. 28-17-10w. T.D. 3,306 ft.; P.B. 3,300 ft.; acd.

Finney County

Atlantic Ref. Co. No. 1 Nunn, C SE NE sec. 27-21-34w. Fsg. 4,311 ft.

Graham County

Continental Oil Co. and Cities Service Oil Co. No. 1 Morel, C W½ E½ NE sec. 15-9-21w. Arb. 3,711 ft.; sat.; set 7-in. 3,712 ft.; R.U.S.T.

Greenwood County

Landon & Mendenhall No. 1 Slough, NE SW sec. 9-24-13e. Arb. 1,973-80 ft.; D. &A.
C. C. Whitaker et al No. 1 Bressner, NW SE sec. 8-26-13e. S.D. 750 ft.

Harper County

Franklin Drlg. Co. No. 1 Waits, NE SW sec. 24-34-6w. Drlg. 4,884 ft.

Jackson County

Lemmick Oil Co. No. 1 Marble Bank, C NE NE sec. 26-9-14. Drlg. 660 ft.

Jewell County

Hollingsworth Bros. No. 1 Wolfe, NE SW SE sec. 14-4s-8w. S.D. 100 ft.

Lane County

Phillips Pet. Co. No. 1 Kees, C SE SE sec. 3-19-30w. T.D. 4,911 ft.; W.O.C.

McPherson County

Darrah et al No. 1 Decker, SW SW SE sec. 12-21-2w. Set 6-in. 3,078 ft.; H.F. W. 3,080-85 ft.; U.R. 3,090 ft.

Meade County

Barnett et al No. 1 Adams, NW SE sec. 22-34-30w. S.D. 69 ft.
Bryan & West No. 1 Brown, NE SW sec. 5-33-27w. Spd. and S.D.

Ness County

Marshall Drlg. Co. et al No. 1 Anderson, SW NW sec. 23-16-24w. Spd. and S.D.
Trojan O. & G. Co. No. 1 Moses, C SW NW sec. 10-18-25w. S.D. 500 ft.
Trojan O. & G. Co. No. 1 Page Milling Co., SE SE NW sec. 36-18-26w. S.D. 3,270 ft.

Reno County

Amerada Pet. Corp. and Westgate-Greenland Oil Co. No. 1 Johns, SE cor. sec. 25-22-5w. Drlg. 3,690 ft.
Carey et al No. 1 McPheeters, NE NW sec. 22-26-8w. U.R. 6-in. 3,772 ft.
McCole et al No. 1 Mathews, SW NW NW sec. 15-24-10w. Fsg. 3,325 ft.

Rice County

Marylyn Oil Co. et al No. 1 Vincent, NW NW NE sec. 5-21-10w. Rig.
Price et al No. 1 Gemeinhardt, NE SE sec. 18-18-10w. T.D. 3,305 ft.; P.B. 3,298 ft.; pmpd. 16 B.O. and S.W. daily.

Rooks County

Graham et al No. 1 Fike, SW cor. sec. 9-8-17w. C.O. 3,384 ft.
Producers Oil Co. No. 1 Ham, SW SW NW sec. 25-7-19w. Set 12-in. 312 ft. (cor.); S.D. 330 ft.

Russell County

Gulf Oil Corp. No. 1 Punker, C E½ NW SW sec. 22-15-12w. Drlg. 2,350 ft.
Jones & Shelbourne et al No. 1 Kuhnle, SE NW sec. 4-15-12w. U.R. 8-in. 2,990 ft.
Lauck & Moncrief No. 1 Miller, NE NW NW sec. 29-13-14w. Drlg. 745 ft.
Parks et al No. 1 Gorham Est., SW NW sec. 19-15-15w. Drlg. 2,835 ft.
Simpson et al No. 1 Boxberger, NE SE NW sec. 10-15-14w. Drlg. 3,022 ft.
G. A. Stearns et al No. 1 Stielow, NW cor. sec. 32-11-14w. S.D. 2,254 ft.

Sedgwick County

Frank Hudson et al No. 1 Fulton, NE SE sec. 35-28-1e. S.D. 1,738 ft.
McKnab No. 1 Garrett, SE SW SW sec. 18-29-2e. Drlg. 3,130 ft.
Union O. & R. Co. et al No. 1 Howell, SW cor. sec. 6-29-1e. Set 10-in. 2,298 ft.; recmtd.

Stafford County

Cardinal Oil Co. et al No. 1 Fischer, SW NW SW sec. 31-21-12w. Drlg. 500 ft.
Continental Oil Co. et al No. 1 **Fair,** CNL SW sec. 12-25-13w. Circ. 4,131 ft.
Continental Oil Co. and Phillips Pet. Co. No. 1 Curtis, SE cor. sec. 26-24-13w. Drlg. 1,350 ft.
National Ref. Co. No. 1 Bonham, SW SE sec. 28-25-12w. Arb. 4,200-06 ft.; S.S.O.; U.R.
Pryor & Lockhart No. 1 De Selms, NE sec. 3-25-11w. Drlg. 2,645 ft.

Sumner County

Hapenny et al No. 1 Evers, SE SE NE sec. 27-31-2e. O.W.D.D.; S.D. 1,519 ft.
Murphy et al No. 1 Tate, SE NW sec. 31-32-2e. Drlg. 130 ft.
Saco Oil Co. et al No. 1 Phipps, SW SE NE sec. 24-30-1w. Drlg. 1,030 ft.
Shawver and Pryor & Lockhart et al No. 1 McKowen, SW cor. sec. 18-32-1w. Drlg. 1,960 ft.

Trego County

Carlock No. 1 Kinzel, SW SW sec. 9-13-22w. Abd. rig.
Manning & Martin No. 1 Lynd, NW SW sec. 16-11-21w. Cg. 3,966 ft.

Woodson County

Craft No. 1 Pratt, NW SW sec. 36-26-15. Drlg. 1,485 ft.

Union O. & R. Co. No. 1 Laidlow, CEL NW SW sec. 35-25-15e. Miss. 1,397-1,400 ft.; T.D. 1,404 ft.; acd.

OKLAHOMA

Week Ending March 26

NORTHERN OKLAHOMA

Beckham County

Mid-American Oil Co. No. 1-A Biscoe, SW cor. sec. 28-8-22w. T.D. 2,705 ft.; S.D.

Cleveland County

W. A. Delaney et al No. 1 Bugher, SE SE SW sec. 12-7-2w. Drlg. 1,790 ft.

Comanche County

Clyde Roach No. 1-A Green, SE SE SW sec. 2-1n-13w. T.D. 670 ft.; S.D.

Creek County

M. W. Mosier et al No. 1 Holcomb, SE SW NW sec. 19-18-8. T.D. 3,018 ft.; 2,-000 ft. W.I.H. and S.S.O.; S.D.

Garfield County

M. R. Hollenback et al No. 1 Clark, NW cor. sec. 34-21-6w. Second Wilcox 7,-298 ft.; T.D. 7,336 ft.; flwd. 218 B.O. in 24 hrs.; acd.

J. E. Kendall et al No. 1-A State, SW cor. sec. 13-23-3w. Spd.

Garvin County

B. C. D. Edwards No. 1 Clark, NE cor. sec. 16-3n-3e. T.D. 2,676 ft.; P.B. 2,088 ft.; drlg. by cmt. 1,891 ft.

Grady County

Doyle Pet. Co. No. 1 Huffine, NW NW SE sec. 30-5-8w. Drk.

Gulf Oil Corp. No. 1 Thomas, SW NW NW sec. 14-4-5w. Drlg. sh. 11,390 ft.

Greer County

J. H. Everitt No. 1 Graumann, NE NW NW sec. 11-5-21w. T.D. 460 ft.; S.D.

R. W. McDonald No. 1 Fite, SE SE sec. 34-7-21w. T.D. 1,114 ft.; H.F.W.; S.D.

J. I. Medlin et al No. 1 Broudie, NW cor. sec. 5-6n-20w. T.D. 90 ft.; (cor.); S.D.

Hughes County

Amerada Pet. Corp. and Stanolind O. & G. Co. No. 1 Martin, NW NE NE sec. 6-9-9. T.D. 3,478 ft.; D.&A.

Amerada Pet. Corp. and Stanolind O. & G. Co. No. 1 Preame, NW NW SE sec. 29-9-9. Core 4,267-68 ft.; to P.B. to Cromw. and test.

Homer Doup et al No. 1 Bank, NE NE NW sec. 7-7-9. Fsg. 335 ft.

E. H. Moore et al No. 1 Hunter, NE NE NW sec. 30-4-9. Drlg. 3,570 ft.

Phillaine Oil Co. No. 1 Morrison, SE SE SW sec. 13-9-10. Drlg. 2,615 ft.

Phillips Pet. Co. No. 1 Becker, NE NW SW sec. 8-5-10. T.D. 6,286 ft.; plug. 5,612 ft.; drld. out to 5,660 ft.; flwd. 75 B.O. in 22 min.

Troup & Strickland No. 1 Brown, NW SW NE sec. 32-6-8. S.D. 660 ft.

Kay County

J. R. Pierse No. 1 Hannon, SE cor. sec. 26-28-2e. T.D. 2,000 ft.; S.D.

E. J. Shaffer et al No. 1 McKee, NE NW sec. 20-28-1w. T.D. 2,500 ft.; S.D.

Kiowa County

Anderson-Prichard Oil Corp. No. 1 Hancock, SE SE NW sec. 23-6-15w. Drlg. 622 ft.

Gauntt & Baker No. 1 Parks, NW NW SW sec. 29-7-20w. S.D. 720 ft.

Lincoln County

Stanolind O. & G. Co. and Amerada Pet. Corp. No. 1 Strader, NW NW NE sec. 18-13-3e. T.D. 5,277 ft.

Wilcox O. & G. Co. No. 1 Evans, SW SW NW sec. 21-14-6. Drlg. 2,520 ft.

Wilcox O. & G. Co. No. 1 Royer, SE SE NE sec. 18-14-6. T.D. 3,372 ft.; S.O.& W.; S.D.

Logan County

Carter Oil Co. No. 1 Lydick, C E½ NW NE sec. 23-15-4w. T.D. 3,672 ft.

Muskogee County

Midco Oil Corp. No. 1 Dunagan, SE SE NE sec. 31-11-19. Drlg. 810 ft.

Okfuskee County

Burke-Greis Oil Co. No. 1 Capps, SE cor. sec. 7-13-7. T.D. 3,227 ft.; w.

Osage County

Chevalier-Simon No. 1 Osage, NW NW SW sec. 33-27-5. Drlg. 1,675 ft.

Norbla Oil Co. No. 1 Osage, SE cor. sec. 18-25-7. Drlg. 235 ft.

Payne County

R. L. Kemp et al No. 1 Rofferty, SE SE NE sec. 6-18-5. Drlg. 3,505 ft.

Marydun Oil Co. et al No. 1 Moore, SE SW NW sec. 17-18-1e. Drlg. 3,985 ft.

Pontotoc County

Caloma Oil Corp. No. 1 Brents, SE NE SW sec. 4-1n-6. Drlg. 1,430 ft.

Cowley et al No. 1 McCormick, NW SW SW SE sec. 27-2n-4e. T.D. 275 ft.; S.D.

H. W. Lee No. 1 Weatherly, NW SE NW sec. 24-1n-7. Drlg. 785 ft.

Jack Lynch et al No. 1-A Parker, SW SW SE sec. 17-4-8. Drlg. 2,105 ft.

Union Dev. Co. No. 1 Abbott, SW NW NE sec. 34-3-6. T.D. 3,320 ft.; S.D.

Pottawatomie County

Hall & O'Mara No. 1 Shaw, NE NE SE sec. 32-6-5. T.D. 3,346 ft.; D.&A.

Seminole County

C. E. Davis et al No. 1 Jones, NW NE SW sec. 34-6-5. T.D. 2,314 ft.; P.B. 2,-307 ft.; swb. 70 B.O. and 14 B.W.

W. A. Delaney et al No. 1 Swan, SE SW SW sec. 18-6-6. Spd.

W. B. Pine No. 1 Wright, SE SE NE sec. 16-6-6. Cd. 3,532-3,672 ft.; T.D.

W. A. Villines et al No. 1 Swan, NW NE NW sec. 26-7-5. T.D. 2,977 ft.; R.U.S.T.

H. V. Woodson and Marydun Oil Co. No. 1 Gilliland, SE SW sec. 24-11-7. T.D. 4,295 ft.; M.I.T.

Texas County

Hagey et al No. 1 Peck, C NE sec. 6-1n-13ecm. T.D. 2,842 ft.; csg. collapsed; S.D.

Harkendorf & Kuhn No. 1 Wiggins, C NW sec. 1-2n-14ecm. 30,000,000 ft. gas 2,745-53 ft.; S.I.

Washita County

L. B. McWhirter No. 1 fee, NW SW SW sec. 34-8-19w. Drlg. 2,120 ft.

SOUTHERN OKLAHOMA

Atoka County

Amerada Pet. Corp. and Stanolind O. & G. Co. No. 1 Ridgway, NE cor. sec. 24-3s-9. Cd. 3,321-31 ft.; D.S.T.

C. M. Sheldon and Gardner Pet. Co. No. 1 Lee, NE NW SW sec. 2-4s-10e. Drlg. 2,463 ft.

Carter County

Texas Co. No. 1-B Cathey, SE NE NE sec. 6-5s-1w. S.O. 4,935-38 ft.; drlg. 5,-015 ft.

Choctaw County

V. K. Chapman and T. N. Low No. 1 Hallum, NE NW NW sec. 4-7s-20. T.D. 815 ft.; D.&A.

Johnston County

W. T. Sheldon No. 1 Chapman, C NW NW sec. 26-4s-6e. T.D. 3,176 ft.; P.B. 2,204 ft.; shot; C.O. 1,000 ft.; S.O.G.

Love County

Sinclair Prairie Oil Co. No. 1 Peabody, NE cor. sec. 35-6s-2w. Drlg. sh. 4,-545 ft.

Marshall County

Paul Robb et al No. 1 Vittitoe, C NE SE sec. 11-5s-4e. C.O. 2,550 ft.

Stephens County

Coline Oil Co. No. 1 Johnson, C SW SE SE NE sec. 1-2n-8w. T.D. 10,000 ft.; P.B. and drld. to 9,086 ft.; swbg. 5,000 ft.; S.O.&G.

Heimerich & Payne No. 1 Mauersberger, C S½ SW SE sec. 29-2n-8w. Drlg. 5,-314 ft.

Tillman County

Gibson & Jennings No. 1 Burleson, SE SE SW sec. 35-2s-19w. T.D. 3,303 ft.; abd.

H. L. Grimes et al No. 1 Hall, SW NE SW sec. 12-3S-19w. Drlg. 1,406 ft.

M. G. Martin No. 1 Parris, NW NW SW sec. 3-3s-19w. T.D. 3,506 ft.; D.&A.

Smith No. 2 Hammell, NE NW NW sec. 6-5s-15w. T.D. 1,581 ft.; S.D.

ARKANSAS

Bradley County

Phillips Pet. Co. No. 1 Marsden, sec. 9-16w-11s. Drk.

Cleveland County

J. T. Markwick and E. O. Olds No. 1 A. Vance, NW cor. NW sec. 18-11-11. S.D. 2,910 ft.; W.O.

Columbia County

Kerr-Lynn Oil Co. No. 1 Barnett, sec. 14-17-20. T.D. 7,740 ft.; set 7-in. csg. 7,-052 ft.; set 723 ft. of 5-in. csg. at 7,-720 ft.; perf. 7,623-51 ft.; swbd. in oil and w. wtr.; cleaned for 15 min.; killed to repair csg. connection; opened well; flwd. oil; closed and re-opened; flwd. short time and went dead; swbg. sulf. wtr.; ran sqz. job.

Standard Oil Co. of La. No. 1 Bodcaw-Barbara, NE cor. SE NW sec. 18-16-22. Top L. 7,292 ft.; L. 7,292-94 ft.; showed S.W.

Standard Oil Co. of La. No. 1 S. T. Crone, NW cor. NW SE sec. 8-16-22. Top L. 7,264 ft.; porous and sat. to 7,-272 ft., T.D.; D.S.T. 7,225-72 ft.; rec. 600 ft. oil and 60 ft. oil and mud in 20 min.; stk. 7-in. csg. 6,970 ft.; fsg. for csg. dropped in hole.

Standard Oil Co. of La. No. 1 W. P. Phillips et al, 660 ft. N and W, C sec. 15-17-19. Sd. 5,327-36 ft.; good odor and sat.; D.S.T. 5,320-36 ft.; failed when shoulder did not hold; rmg. for D.S.T.

Crittendon County

Manning & Martin No. 1 Cartwright, SW cor. sec. 16-7n-8e. S.D. 4,200 ft.

Desha County

Columbian Fuel Corp. No. 1 Cross, SW cor. sec. 34-8s-3w. R.U.

Hempstead County

H. D. Easton et al No. 1 LaGrone, sec. 5-12-26. T.D. 2,940 ft.; P.B. 1,007 ft.; drlg. 2,116 ft.

Lincoln County

Fitzwater, Inc., No. 1 Owens, sec. 26-9s-8w. Drld. to 1,130 ft.; S.D.

Little River County

Heenan & Coe No. 1 Waldrop, SE NW sec. 21-12-28. S.D. 1,960 ft.

Joe G. Strahan et al No. 2 Dierks Lbr. Co. Drlg. 2,330 ft.

Miller County—Rodessa

F. W. Burford No. 2 Ahern, sec. 10-20-28. Drlg. 3,811 ft.

Burden & Cummings No. 1 Treadway, sec. 10-20-28. Drlg. 5,433 ft.

R. Lacy No. 2 Grogan, E½ W½ sec. 15-20-28. Por. L. 5,965-84 ft.; set 7-in. csg. 5,972 ft.; T.D. 6,025 ft.; comp.; 47 B.P.H. on 1-in. ck.

W. M. Layton No. 2 McKellar, sec. 15-20-28. R.U.

McClanahan & Feazel No. 2 Eason, C N½ NW SW sec. 12-20-28. Set 7-in. csg. 6,060 ft.; tstd. some oil 6,112 ft.; acd. with 3,000 gal.; swbg. to test; T.D. 6,112 ft.

B. B. Orr No. 1 Mitchell, sec. 10-20-28. Set 9⅝-in. csg. 1,996 ft.; drlg. 4,331 ft.

Roberts Drlg. Co. No. 2-B Capps, sec. 10-20-28. Set 13⅜-in. csg. 160 ft.

L. R. Skidmore No. 1-B Mitchell, sec. 11-20-28. Drlg. sh. 1,100 ft.

Texas Canadian Oil Corp. No. 2 Thomas, NE cor. NW SE sec. 12-20-28. T.D. 6,-203 ft.; perf. 7-in. csg. 6,108-78 ft.; tstd. S.W.; arng. P.B. 6,160 ft.; tstd. S.W.; set pkrs. 6,140 ft.; swbg. to test.

Mrs. S. O. Thompson No. 1 Concord Methodist Church, NE cor. SE NE sec. 10-20-28. Drlg. L. 5,291 ft.

Mrs. S. O. Thompson No. 2 Greer, sec. 11-20-28. Drlg. sh.&L. 3,673 ft.

Ouachita County

Copenhaven Oil Corp. No. 1 Evans, NE cor. NE SW sec. 20-11-19. S.D. 1,825 ft.

A. H. Tarver et al No. 1 Guy Smith, sec. 16-14-19. Tokio sd. 2,188-2,210 ft.; T.D. 2,331 ft.; W.O.

Pulaski County

A. L. Kitselman, No. 2 A. L. Kitselman Jr., SE SE SW sec. 2-1s-13e. Drlg. v. hd. bl. slate 2,608 ft.

Union County—Shuler

Alice Sydney Oil Co. No. 1 Powledge, SE cor. SW SE sec. O.W.W.O.; cg. L. 7,702 ft.

E. M. Jones No. 3 Marine Oil Co., NE NW SE sec. 17-18-17. Set 16-in. csg. 138 ft.; drlg. 3,214 ft.

E. M. Jones et al No. 2-A Murphy, sec. 19-18-17. Set 10¾-in. csg. 1,772 ft.; W. O.C.; T.D. 1,800 ft.

Lion Oil Ref. Co. No. 2 Marine Oil Co., SW cor. E½ SE¼ sec. 17-18-17. T.D. 7,650 ft.; 5½-in. csg. 7,648 ft.

Lion Oil Ref. Co. No. 3 Marine Oil Co., sec. 17-18-17. Drlg. 1,525 ft.

Lion Oil Ref. Co. No. 1 Mayfield, SE cor. Lot 3, Fract. NW¼ sec. 18-18-17. Drlg. rd. bds. 5,683 ft.

Lion Oil Ref. Co. No. 1 Miller, SW cor. NE NW sec. 18-18-17. Cg. 7,683 ft.

Lion Oil Ref. Co. No. 4-A Edna Morgan, NW cor. Lot 1, SW sec. 18-18-17. Drlg. rd. and gry. sh. 6,530 ft.

Lion Oil Ref. Co. No. 5-A E. Morgan, NE cor. Lot 7, SW sec. 18-18-17. Drlg. rd. and gry. sh. 6,476 ft.

Lion Oil Ref. Co. No. 2-C D. S. and J. C. Morgan, SW cor. SE SE sec. 18-18-17. Drlg. rd. and gry. sh. 6,928 ft.

Marine Oil Co. No. 4 fee, NW cor. SW SW sec. 17-18-17. T.D. 7,590 ft.; set 7-in. csg. 7,578 ft.; comp.; 1,865 B.P.D.; ½-in. ck.

Marine Oil Co. No. 5 fee, sec. 17-18-17. M.I.R.

Marine Oil Co. No. 3 Justiss, NE cor. Lot 7, NW sec. 18-18-17. T.D. 7,610 ft.; set 7-in. csg. 7,610 ft.

Marine Oil Co. No. 1 Miller, SE cor. Lot 1, NW sec. 18-18-17. Drlg. sdy. sh. 6,-967 ft.

Phillips Pet. Co. No. 3 Justiss, Lot 6, sec. 18-18-17. R.U.

Phillips Pet. Co. No. 4 Justiss, Lot 6, sec. 18-18-17. Set 10¾-in. csg. 2,266 ft.; drlg. sh.&L. 5,440 ft.

Phillips Pet. Co. No. 1 Marine Oil Co., NE cor. NW NE sec. 20-18-17. Top Jones sd. 7,527 ft.; Top L. 7,612 ft.; salty taste; T.D. 7,640 ft.; set 7-in. csg. 7,617 ft.; swbg.

Phillips Pet. Co. No. 2 Marine, NE cor. NW NE sec. 20-18-17. Drlg. sh.&sd. 3,957 ft.

Phillips Pet. Co. No. 3 Marine Oil Co., sec. 20-18-17. R.U.

Phillips Pet. Co. No. 2 Rosen, SE cor. SW NE sec. 18-18-17. Top Jones sd. 7,531 ft.; top L. 7,634 ft.; T.D. 7,700 ft.; set 7-in. csg. 7,682 ft.

Texas Canadian Oil Corp. No. 1 Powledge, C NE NW NW sec. 21-18-17. Drlg. rd. and gry. sh. 5,961 ft.

Union County—Other

Ark. Southern Oil Corp. No. 2-A Simmons, SW cor. NE NW sec. 15-18-18. T.D. 2,307 ft.; O.I.H.; pmpg.; no ga.

E. G. Bradham No. 1 S. L. Robbins, SW cor. SW NE sec. 12-19-16. S.D. sdy. sh. 2,300 ft.

Penn-Ark. Pet. Corp. No. 1 Raulston, sec. 12-17-14. T.D. 3,175 ft.; S.D.; litigation.

W. D. Wingfield, Tr. No. 2 Kidd Est., SE cor. NW SW sec. 15-18-13. Sd. S.D. 2,257-2,300 ft.; set 6-in. csg. 2,250 ft.; T.D. 2,300 ft.; W.O.S.R.

W. D. Wingfield, Tr., No. 1 Union Sawmill Co., sec. 15-18-13. Set 10-in. csg. 60 ft.; W.O.C.

LOUISIANA

NORTH LOUISIANA PROVEN

Caddo—Rodessa

Gulf Oil Corp. No. 2 Allison, sec. 3-23-16. Drlg. 370 ft.

J. S. Rushing No. 2 Alexander, NW cor. sec. 3-23-16. T.D. 5,972 ft.; 7-in. csg. 5,919 ft.; comp.; 25 B.P.H.; ½-in. ck.

Shell Pet. Corp. No. 1-B Govt., SE cor. SW SE sec. 3-23-16. T.D. 5,973 ft.; 7-in. csg. 5,930 ft.; comp.; 8 B.P.H.; ¼-in. ck.

Shell Pet. Corp. No. 2-B U. S. Govt., SE cor. sec. 3-23-16. Drlg. sh.&L. 4,700 ft.

Shell Pet. Corp. No. 3-B U. S. Govt., sec. 3-23-16. Drlg. rd. bds. 3,733 ft.

Shell Pet. Corp. No. 4-B U. S. Govt., sec. 3-23-16. Drlg. sh.&L. 4,459 ft.

Standard Oil Co. of La. No. 2 Spearman, SE cor. SE SE sec. 3-23-16. Set 7-in. csg. 5,934 ft.; T.D. 5,972 ft.; comp.; 182 B.P.D.; 16/64-in. ck.

N. LOUISIANA WILDCATS

Bienville Parish

Gulf Ref. Co. No. 1 Goodpine, sec. 25-14-8. Drlg. sd.&sd. 9,192 ft.

Producers O. & G. Co. No. 1 Locke, NE cor. sec. 9-15-10. O.W.W.O.; old T.D. 2,960 ft.; rmd. to 800 ft.; S.G.; W.O.

Bossier Parish

C. H. French No. 2 Larkin, NW cor. SE sec. 14-19-11. T.D. 389 ft.; set 4½-in. csg. 351 ft.; comp.; pmp. 20 B.P.D.

Premier Inv. Co. No. 1 McDade, SE SW NE sec. 28-19-11. Drlg. sh. 1,925 ft.

Triangle Drlg. Co. No. 2-C Skannel, sec. 13-17-12. T.D. 3,140 ft.; P.B. 3,120 ft.; tstg.; 5½-in. csg. 3,094 ft.

Union Prod. Co. No. 2-C Skannel, sec. 13-17-12. Drlg. sh. 2,230 ft.

Caddo Parish

Ardsell Oil Co. and H. W. Russell No. 2 Muslow, sec. 26-21-16. O.W.W.O.; T.D. 2,246 ft.; set 5½-in. csg. 2,205 ft.; W. O.S.R.

D.O.K. Oil Co. No. 1 Player, SE cor. NW SE sec. 26-21-5. O.W.W.O.; old T.D. 1,-600 ft.; set 4½-in. csg. 2,252 ft.; W. O.S.R.; T.D. 2,255 ft.

Driscoll No. 1 Muslow, sec. 4-20-15. T.D. 2,175 ft.; set 6⅝-in. csg. 2,152 ft.

J. P. Driscoll No. 2 Sattelite, sec. 10-20-15. R.U.

W. D. Flynn No. 3 Natalie, SW cor. sec. 10-21-16. T.D. 1,029 ft.; W.O.S.R.

W. D. Flynn No. 4 Natalie, SE cor. sec. 10-21-16. R.U.

W. H. Harrison, Jr., No. 3 Crystal Shoreline, SW cor. SW NW sec. 25-21-16. Set 4-in. csg. 2,255 ft.; T.D. 2,264 ft.; W.O.S.R.

La. Oil Prod. Co. No. 14-B Muslow, sec. 4-20-15. Set 6-in. csg. 2,148 ft.; W.O.C.

Olson Drlg. Co. No. 1 Sharp, C NW NE sec. 10-18-16. Sd. 6,021-27 ft.; T.D. 6,-065 ft.; perf. 6,011-21 ft.; no show; perf. 6,002-11 ft.; well started flwg. mud; ran tbg. and tstg.

Pet. Heat & Power Co. No. 3 Stiles, sec. 33-21-16. T.D. 946 ft.; fsg.

Petroleum Heat & Power Co. No. 1 Wemple, NW cor. sec. 14-20-15. Set 6-in. csg. 2,185 ft.; T.D. 2,210 ft.; D.D. 2,229 ft. and tstd. S.W.

W. G. Ray Drlg. Co. No. 5 Hunter, NE cor. sec. 17-19-14. Set 6⅝-in. csg. 2,-428 ft.; swbg. S.W.; S.O. 2,451 ft.

J. E. Sedberry No. 1-A Dickinson, sec. 10-19-14. Set 10-in. at 80 ft.; W.O.C.

Triple M Oil Co. No. 1 Boisseau, sec. 34-21-16. Drlg. 1,485 ft.

Williams & Long No. 1 Stiles, sec. 20-21-16. Set 6-in. csg. 1,014 ft.

Claiborne Parish

Atlantic Ref. Co. No. 1 English, sec. 29-21-4. Drlg. sh.&anhy. 3,938 ft.

E. O. Heath No. 1-C Patton, sec. 1-20-5. Set 5½-in. csg. 5,345 ft.; T.D. 5,370 ft.

Hollifield & McFarland No. 3 Patton Est., SE cor. SE NE sec. 2-20-5. T.D. 5,249 ft.; set 7-in. csg. 5,236 ft.; comp.; 75 B.P.H. on 1-in. ck.
Hollifield & McFarland No. 4 Patton Est., sec. 2-20-5. R.U.
J. R. McMurray No. 2 Bean, sec. 32-21-4. T.D. 5,174 ft.; set 5½-in. csg. 5,154 ft.; comp.; 25 B.P.H. on 16/64-in. ck.
W. H. North No. 1 Patton Est., sec. 11-20-5. Drlg. sh. 4,310 ft.
E. T. Oakes et al No. 2 L. Lloyd, SE SE sec. 3-20-5. T.D. 5,328 ft.; set 5½-in. csg. 5,314 ft.; comp.; 71 B.P.H.; open tbg.
A. O. Olson No. 8-A Patton, sec. 30-21-4 T.D. 5,080 ft.; set 5½-in. csg. 5,068 ft.; comp.; 32 B.P.H. on 20/64-in. ck.
Unifon Prod. Co. No. 2 Brownfield, sec. 5-19-5. T.D. 9,964 ft.; sh.; recmtd. back to 8,850 ft.; rmg. bridge at 8,475 ft.; rlg. sh. 9,552 ft.
Union Prodl. Co. No. 1 Coleman, sec. 43-7-9e. Drlg. sh. 414 ft.
G. H. Vaughn No. 1 Eppinger, C SW NE sec. 30-21-4. Drlg. sh.&anhy. 4,020 ft.
Weaver Oil Corp. No. 2 Edmonds, sec. 16-20-5. Drlg. 1,950 ft.

Concordia Parish

Coastal Mineral & Dev. Co. No. 1 Winsten, sec. 23-7-9e. D.&A. 2,027 ft.

De Soto Parish

Clear Lake Oil Co. No. 1 J. A. Woolum, NW sec. 29-12-12. W.O.; T.D. 2,690 ft.
La. Seaboard Oil Ref. Co. No. 1 Lawrence, sec. 36-12-14. Drlg. 1,685 ft.
Major Oil Co. No. 1 Glauque, sec. 18-11-11. S.D. 2,750 ft.
Pet. Heat & Power Co. No. 1 DeSoto Corp., SE cor. SW NW sec. 7-11-11. Missed sd.; T.D. sh. 2,868 ft.; S.D.
Pet. Heat & Power Co. No. 1 Matthews, sec. 29-12-11. Drlg. L.&sh. 3,890 ft.
Pet. Heat & Power Co. No. 2 Matthews, sec. 30-12-11. Set 7-in. csg. 2,505 ft.; T.D. 2,507 ft.; perf. 2,475-80 ft.; comp.; 6,392,000 ft. gas; R.P. 1,120 lbs.
Pet. Heat & Power Co. No. 1 Sample, sec. 29-12-11. Set 7-in. csg. 2,680 ft.; perf. 2,649-59 ft.; tstg.
Pet. Heat & Power Co. No. 1 Taylor, NE cor. NE SE sec. 12-11-12. T.D. 3,695 ft.; P.B. 2,800 ft.; D.&A.
Pet. Heat & Power No. 1 Williams Est., NE cor. SW SE sec. 12-11-12. Sd. 2,760-87 ft.; T.D. 2,818 ft.; D.&A. 2,832 ft.
Pet. Heat & Power No. 1 Williams, W. R., NW NE sec. 13-11-12. (Cor.); D.S. T. 2,800-18 ft.; S.G.; 7-in. csg. set 2,827 ft.
Texas Co. No. 2 White, SW NE sec. 24-12-12. Set 4½-in. csg. 835 ft.; tstd. dry; S.G.; W.O.; T.D. 890 ft.
Yandell Rogers No. 1 Kavanaugh, sec. 18-11-11. Cg. 2,810 ft.

Franklin Parish

Southern Star Pet. Co. No. 2 Grayson, NE cor. NE SE sec. 36-12-6e. S.D. 1,754 ft.

La Salle Parish

Alexander & Jarvis No. 1 Tremont, sec. 2-9-1e. Drlg. sh. 1,205 ft.
Cuppies et al No. 1 King, sec. 25-10-1e. Drlg. sh. 1,510 ft.
Graham & Harter No. 2 Urania, sec. 18-10-2e. Comp.; pmp. 40 B.P.D.; set 6-in. csg. 1,515 ft.; T.D. 1,528 ft.
Pet. Heat & Power Co. No. 2 Wright, sec. 26-10-1e. Drlg. sh. 205 ft.

Lincoln Parish

F. H. Brown No. 2 Patton, C S½ SE SW sec. 6-20-4. R.U. and S.D.
Magnolia Pet. Co. No. 2 Pollock, C S½ NE SE sec. 6-20-4. Set 7-in. csg. 5,323 ft.; T.D. 5,325 ft.
E. T. Oakes & Easton No. 1 Griggs, sec. 36-18-1w. T.D. 6,259 ft.; swbd. dry; W.O.

Morehouse Parish

W. J. Furlong No. 1 Clark, sec. 10-20-7e. Set 9⅝-in. csg. 2,805 ft.; top Big L. 6,207 ft.; hd. gr. cal. strks. L.; ran steel line measurement and Schlumberger; cg. bl. limey sh. 6,874 ft.

Natchitoches Parish

Jos. E. Popkins No. 1 Peavy Lbr. Co., NW sec. 36-7n-9w. R.U.; S.D.

Red River Parish

Glassell & Whitehurst No. 1 LeLong, NE NW NE sec. 25-12-11. S.D. 2,874 ft.
Yandell Rogers No. 5 Gaspair, SE SW sec. 27-13-11. Set 5⅞-in. csg. 2,453 ft.; T.D. 2,474 ft.; W.O.S.R.

Sabine Parish

H. N. Morris No. 1 Irving & Bishop, C NW NW sec. 18-7-12. Drlg. sh. 495 ft.
Pearl Oil Corp. No. 7 Cranford, SW cor. SW SE sec. 20-9-13. Set 6-in. at 1,475 ft. acdzd.; drlg. 1,687 ft.
Plymouth Oil Corp. No. 1 Kezerle, sec. 3-7-13. Set 10-in. csg. 60 ft.
W. L. Posey No. 1 Ramirez, C NW NW sec. 12-7-13. Set 6-in. csg. 2,111 ft.; tstd.; S.O.; arng. to D.D. 2,167 ft.
Sutton-Zwolle Oil Co. No. 1 Sabine Lbr. Co., SE cor. NW NE sec. 23-7n-14w. Set 9⅝-in. csg. 2,215 ft.; D.S.T. 3,843-53 ft.; rec. 1,200 ft. P.L.O. 9 min.; W.P. 275 lbs.; T.D. 3,865 ft.; set 7-in. csg. 3,846 ft.; T.D. 3,857 ft.; acdzd. with 750 gals.; tstd. some oil; reacdzd. with 3,000 gals. and tstd. dry; W.S.O.

Tensas Parish

H. V. Schumacker No. 4 Mount Plantation, sec. 39-11-12e. Set 12½-in. csg. 100 ft.

Union Parish

Standard Oil Co. of La. No. 1 Frost Lbr., sec. 14-21-1e. Cg. sd. 8,271 ft.

Webster Parish

S. W. L. Backus No. 4 Pardee Co., NE sec. 3-22-11. Set 10-in. csg. 156 ft.
Fohs Oil Co. No. 1 Crichton, sec. 33-21-10. Drlg. sh. 2,190 ft.
Hunt Oil Co. No. 6 Babb, C NE SW sec. 14-21-10. Drlg. L.&sh. 5,137 ft.
Hunt Oil Co. No. 8 Davis, C NW NE sec. 23-21-10. Drlg. anhy.&sh. 5,290 ft.
Hunt Oil Co. No. 19 Hope, NW cor. sec. 24-21-10. Cd. oil sd. 5,824-32 ft.; drlg. sh. 6,300 ft.
Magnolia Pet. Co. No. 1 Coyle-Tiner, C sec. 21-21-10. Drlg. sh.&sd. 6,820 ft.
Magnolia Pet. Co. No. 2 Crichton, SE cor. NE NW sec. 33-21-10. Top Holloway sd. 5,766 ft.; set 7-in. csg. 5,765 ft.; T.D. 5,776 ft.
Magnolia Pet. Co. No. 1 Sexton Unit, NW SE sec. 32-23-9. Cd. Bodcaw sd.; no show; cd. sd. 8,293-8,310 ft.; gas odor; slight show gas and dist.; cg. hd. sdy. L. 8,599 ft.; ran Schlumberger 8,521 ft.
Midstates Oil Corp. No. 1 Welori Lbr. Co., C NW NW sec. 3-20-10. Drlg. sh. &L. 3,960 ft.
Morgan et al No. 1-A Hope, C NW NW sec. 25-21-10. Drlg. sh.&L. 5,302 ft.
North American Oil Consol. Co. No. 1 Stewart, C SE NE sec. 32-27-10. Set 9⅝-in. csg. 5,866 ft.; drlg. sh. 8,216 ft.
Ohio Oil Co. No. 3 Bodcaw, Acct. 4, sec. 28-21-10. Drlg. L.&sh. 4,711 ft.
Ohio Oil Co. No. 49 Bodcaw (Acct. 3), C NW NW sec. 34-21-10. Set 13⅜-in. csg. 808 ft.; drlg. sh. 6,648 ft.
Ohio Oil Co. No. 1 Crutsinger, NE cor. sec. 35-21-10. Drlg. sh. 6,656 ft.
Ohio Oil Co. No. 1 Gray, NW cor. SE NW sec. 28-21-10. Drlg. sh. 4,028 ft.
Ohio Oil Co. No. 24 Gray, NE cor. sec. 35-21-10. Drlg. sh.&L. 4,967 ft.
Ohio Oil Co. No. 5 Holloway, NE cor. SE NE sec. 23-21-10. Drlg. L. 4,840 ft.
Ohio Oil Co. No. 1 Sandlin, sec. 27-21-10. R.U.
Ohio Oil Co. No. 5 Holloway, NE cor. SE NE sec. 23-21-10. O.W.W.O.; R.U. to deepen.
Ohio Oil Co. No. 1 Jackson, sec. 27-21-10. R.U.
Oliphant No. 3 Banks, sec. 34-21-10. Drlg. L. 5,384 ft.
A. G. Oliphant No. 1 Stewart, sec. 33-21-10. Holloway sd.; no show; drlg. sh. &L. 6,030 ft.
Stanolind O. & G. Co. No. 1 Pardee Co., SW NE sec. 36-21-10. Drlg. sh. 6,157 ft.
Union Prod. Co. No. 1 Stewart, SE cor. SE sec. 28-21-10. Drlg. hd. sdy. sh. 7,841 ft.

Winn Parish

G. W. Ziegen No. 13 La. Cen. Lbr. Co., sec. 4-13-1e. 12-in. at 62 ft.; W.O.C.

SOUTH LOUISIANA FIELDS

Abbeville—Vermilion Parish

Continental Oil Co. No. 1 Faulk, sec. 66-12s-3e. 10¾-in. csg. 1,585 ft.; drlg. sh. 8,751 ft.
Continental Oil Co. No. 1 Hebert, sec. 67-12s-3e. 10¾-in. csg. 1,510 ft.; drlg. L.&sh. 6,512 ft.

Anse La Butte—St. Martin Parish

G. D. Spell No. 1 Deborah, sec. 117-9s-5e. R.U.

Bay St. Elaine—Terrebonne Parish

F. J. LeBlanc No. 2 Wurzlow, sec. 17-22s-18e. S.D. 816 ft.
Texas Co. No. 16 State, sec. 12-22s-17e. Drlg. sh.&sd. 2,911 ft.

Bayou Blue—Iberville Parish

Humble O. & R. Co. No. 6 Wilbert Sons Lbr. Co., sec. 66-9s-11e. Drlg. sh. 5,665 ft.

Bayou Cocotriz—Terrebonne Parish

Shell Pet. Corp. No. 5 Pelican, 10¾-in. csg. 2,480 ft.; drlg. sd. 8,950 ft.
Shell Pet. Corp. No. 5-B Realty Co. Drlg. sh. 2,458 ft.

Bayou De Allemands—St. Charles Parish

Amerada Pet. Corp. No. 1 Gheens Realty Co., sec. 56-15s-20e. Drlg. sdy. sh. 6,000 ft.

Big Lake—Cameron Parish

Union Sulphur Co. No. 2 Miami Corp., sec. 19-12s-8w. T.D. 7,924 ft.; P.B. 7,650 ft.; to sdtrk.; drlg. sh.&sd. 8,607 ft.

Black Bayou—Calcasieu Parish

Shell Pet. Corp. No. 40 Watkins. T.D. 6,235 ft.; tstg.

Edgerly—Calcasieu Parish

La. Crusader Oil Co. No. 1 La. Prairie, sec. 21-9s-11w. T.D. 5,108 ft.; P.B. and sdtrk.; T.D. 3,082 ft.; P.B. and S.T. 2,350 ft.; T.D. 2,891 ft.; P.B. and sdtrkd.; T.D. 4,579 ft.; salt; abd.

Caillou Island—Terrebonne Parish

Texas Co. No. 1 L.L.&E., sec. 18-23s-20e. Drlg. sh.&sd. 5,172 ft.

Cameron Meadows—Cameron

Burton-Sutton Oil Co. No. 23 School Ld., sec. 16-14s-13w. Cg. sd. 3,878 ft.
Magnolia Pet. Co. No. 22 Cameron Meadows, sec. 21-14s-13w. Drlg. sdy. sh. 2,172 ft.

Cheneyville—Rapides Parish

Amerada Pet. Corp. No. 4 Well, sec. 53 1s-2e. 9⅝-in. csg. 6,471 ft.; T.D. 7,045 ft.; salt; P.B. 6,735 ft.; set lnr. 6,398-6,735 ft.; tstg.

Charenton—St. Mary Parish

Pan American Prod. Co. No. 2-A Eucer, sec. 11-13s-9e. Drk.
Pan American Prod. Co. No. 5 Law Realty Co., sec. 21-13s-9e. T.D. 1,890 ft.; 7-in. csg. 1,829 ft.
Pan American Prod. Co. No. 3 Robichaux, sec. 11-13-9e. T.D. 2,654 ft.; 7-in. csg. 2,639 ft.
Pan American Prod. Co. No. 3 South Coast Corp., sec. 30-18s-10e. T.D. 7,833 ft.; P.B. 7,228 ft.; sdtrkd.; drlg. sh. 7,562 ft.

Choctaw—Iberville Parish

La. Crusader Oil Co. No. 2 Schwing, sec. 29-8s-11e. R.U.
Standard Oil Co. No. 8 Gay, sec. 52-9s-11e. T.D. 6,801 ft.; P.B. 3,200 ft.

Darrow—Ascension Parish

Darrow Oil Co. No. 1 Dennis, sec. 68-10s-2e. T.D. 2,150 ft.
Humble O. & R. Co. No. 17 Community, sec. 33-10s-2e. Drlg. sh. 3,048 ft.
Humble O. & R. Co. No. 13 Gumbel, sec. 33-10s-2e. T.D. 6,954 ft.; 7-in. csg. 6,940 ft.; I.P. 705 B.P.D.; ¼-in. ck.
Kiva Oil Co. No. 1 Duplessis, sec. 69-10s-2w. T.D. 60 ft.; S.D.

Dog Lake—Terrebonne Parish

Texas Co. No. 21 State, sec. 5-22s-16e T.D. 7,174 ft.; P.B. 5,490 ft.; drlg. out cmt. at 5,453 ft.

Fausse Point—Iberia Parish

Texas Co. No. 4 State, sec. 35-11s-8e, 18⅝-in. csg. 90 ft.; top sd. 7,912 ft.; top salt 6,595 ft.; drlg. sh.&sd. 8,721 ft.

Four Isle—Terrebonne Parish

Texas Co. No. 9 L.L.&E., sec. 24-21s-16e. T.D. 8,553 ft.; P.B. 3,881 ft.; sdtrk.; T.D. 6,943 ft.; 9⅝-in. csg. 6,870 ft.; drlg. sh. 10,719 ft.

Garden Island—Plaquemines Parish

Texas Co. No. 18 State, sec. 37-23s-33e. T.D. 5,064 ft.; P.B. and sdtrkd.; T.D. 4,912 ft.; fsg.
Texas Co. No. 26 state, sec. 37-23s-33e T.D. 7,200 ft.; salt; 7⅝-in. csg. 4,421 ft.; perf. csg. 4,072-4,148 ft.; tstg.

Hackberry—Cameron Parish

W. T. Burton No. 3 Lewis, sec. 22-12s-10w. R.U.
W. T. Burton No. 5 Vincent, sec. 22-12s-10w. T.D. 3,410 ft.; sdtrkd.; T.D. 3,232 ft.; 7-in. csg. 3,147 ft.
F. J. LeBlanc No. 1 Doiron, sec. 36-12s-10w. Drlg. sh. 3,690 ft.
Stanolind O. & G. Co. No. 8 Carter & Sweeney, sec. 22-12s-10w. R.U.
Stanolind O. & G. Co. No. 10 Carter & Sweeney, sec. 22-12s-10w. R.U.; (cor.).
Stanolind O. & G. Co. No. 8 Duhon, sec. 22-12s-10w. T.D. 3,300 ft.; perf. csg. 3,230-44 ft.; I.P. 148 B.P.D.; flwg. by hds.
Stanolind O. & G. Co. No. 54 State-Kelso, sec. 16-12s-10w. T.D. 5,825 ft.; P.B. 4,000 ft.; drlg. sd.&sh. 4,560 ft.
Superior Oil Co. No. 1 Benson-Vincent, sec. 30-12s-10w. Drlg. sh. 6,674 ft.
Texas Co. No. 24-B State, sec. 12s-9w. Drlg. sh. 7,546 ft.
Union Sulphur Co. No. 1 Doiron, sec. 37-12s-10w. T.D. 4,888 ft.; 7-in. csg. 4,876 ft.; heaving sh. 5,940 ft.; P.B. 3,572 ft.; sdtrkg. at 3,531 ft.; drlg. sh. 4,312 ft.
York Oil Field Supply No. 3 Vincent, sec. 28-12s-10w. T.D. 2,947 ft.; P.B. 2,895 ft.; P.B. 2,848 ft.; to sdtrk.; T.D. 3,285 ft.; P.B. to 2,800 ft.; W.O.C.

Horseshoe Bayou—St. Mary Parish

Texas Co. No. 1 St. Mary Parish Ld. Co., sec. 37-17s-9e. 13⅜-in. csg. 1,837 ft.; cg. sh.&L. 10,752 ft.; cd. sd.; oil odor 10,655-95 ft.; sd. 10,716-22 ft.

Jeanerette—St. Mary Parish

Herton Oil Co. No. 2 Carter, sec. 38-13s-9e. T.D. 9,939 ft.; 7-in. csg. 9,937 ft.; T.D. 10,476 ft.; well tried to blow out; fsg.
Herton Oil Co. No. 1-A Roane Sugar Co., sec. 38-13s-9e. Drk.

Jennings—Acadia Parish

H. Fotiades No. 2 Washington Opelousas, sec. 41-9s-2w. 16-in. csg. 106 ft.; drlg. sh. 3,280 ft.
Gulf Ref. Co. No. 39 Arnaudit, sec. 47-9s-2w. T.D. 4,840 ft.; P.B. 2,585 ft.; T.D. 4,586 ft.; 9⅝-in. csg. 4,578 ft.; cg. sd. &L. 5,712 ft.
Jolly Pet. Co. No. 2 McFarlain, sec. 41-9s-2w. T.D. 6,420 ft.; surveying hole.
Pet. Heat & Power Co. No. 1 Iowa-Jennings, sec. 45-9s-2w. Drlg. 108 ft.
Stanolind O. & G. Co. No. 19 Houssiere-Latreille, sec. 47-9s-2w. T.D. 6,448 ft.; P.B. 6,135 ft. to strtn. hole; T.D. 6,979 ft.; P.B. 6,700 ft.; drlg. sh. and sd. 7,616 ft.
Superior Oil Co. No. 2 Julis Clement, sec. 46-9s-2w. Drlg. sh.&shells 4,327 ft.
Superior Oil Co. No. 6 Jennings-Heywood, sec. 41-9s-2w. T.D. 6,056 ft.; fsg. P.B. and sdtrkd.; drlg. sh. 5,234 ft.
Superior Oil Co. No. 9 Leckelt, sec. 42-9s-2w. T.D. 7,480 ft.; P.B. 5,302 ft.; T.D. 7,062 ft.; P.B. 5,120 ft.; cg. oil sd. 7,061 ft.
Superior Oil Co. No. 10 Leckelt, sec. 43-9s-2w. R.U.
Superior Oil Co. No. 11 Leckelt, sec. 42-9s-2w. Drlg. sh. 6,438 ft.
Superior Oil Co. No. 12 Leckelt, sec. 42-9s-2w. Drlg. sh. 4,783 ft.
Superior Oil Co. No. 13 Leckelt, sec. 42-9s-2w. R.U.
Victor Weisse No. 1 Clement, sec. 46-9s-2w. Top salt 3,819 ft.; S.D. 3,938 ft. D.S. stk.; T.D. 3,139 ft.; fsg.

Lafitte—Jefferson Parish

Texas Co. No. 10 Lafitte, sec. 17-17s-24e. Drlg. sh.&L. 4,192 ft.
Texas Co. No. 2 Marrero Ld. & Inv. Co., sec. 21-17s-24e. T.D. 10,187 ft.; 7⅝-in. csg. 10,159 ft.; perf. csg. 10,065-95 ft.; I.P. 1,301 B.P.D.; ⅝-in. ck.
Texas Co. No. 3 Marrero Ld. Co., sec. 29-17s-24e. R.U.
Texas Co. No. 9 Rigolet-Cooperation Fur Co., sec. 29-17s-24e. Drlg. sh.&L. 8,630 ft.

Lake Long—Lafourche Parish

Fohs Oil Co. No. 4 State, sec. 64-17s-19e. 10¾-in. csg. 2,707 ft.; drlg. sdy. sh. 6,246 ft.

Lake Pelto—Terrebonne Parish

Texas Co. No. 19 State-Lake, sec. 17-23s-18e. T.D. 5,703 ft.; rmg.

Leesville—Lafourche Parish

Texas Co. No. 68 L.L.&E., sec. 27-21s-22e. Top salt 5,175 ft.; T.D. 5,186 ft.; P.B. 4,010 ft.

Lirette—Terrebonne Parish

Humble O. & R. Co. No. 1 Wurzlow, sec. 32-19s-19e. Drlg. sh. 5,840 ft.
Union Prod. Co. No. 1 Fundenburk, Unit 1, sec. 50-19s-19e. Drlg. sh. 4,130 ft.

New Iberia—Iberia Parish

Wm. Helis No. 5 Bolivar, sec. 56-12s-7e. T.D. 4,337 ft.; salt; P.B. and sdtrkd.; T.D. 3,594 ft.; 7-in. csg. 3,100 ft.; W. O.C.
Wm. Helis No. 4 Schwing, sec. 56-12s-7e. T.D. 4,216 ft.; P.B.; sdtrkd.; drlg. sh. 1,792 ft.
Texas Co. No. 10-B Hanzen, sec. 54-12s-7e. T.D. 5,235 ft.; 7⅝-in. csg. 5,215 ft.; W.O.C.; I.P. 552 B.P.D.; ¼-in. ck.

North Crowley—Acadia Parish

Humble O. & R. Co. No. 2 Habetz, sec. 45-8s-1e. Drk.
Humble O. & R. Co. No. 1 Smith, sec. 44-8s-1e. T.D. 8,047 ft.; fsg.
Humble O. & R. Co. No. 1 Traham, sec. 3-9s-1e. Drlg. sh. 9,018 ft.

Port Barre—St. Landry Parish

Pan American Prod. Co. No. 4 Cormier, sec. 4-6s-5e. T.D. 4,978 ft.; 7-in. csg. 4,960 ft.; I.P. 450 B.P.D.; ¼-in. ck.
Texas Co. No. 22 Botney Bay Lbr. Co., sec. 4-6s-5e. T.D. 3,569 ft.; P.B. 3,405 ft.

Quarantine Bay—Plaquemines Parish

Gulf Ref. Co. No. 4 State, sec. 17-19s-17e. T.D. 5,700 ft.; 9⅝-in. csg. 5,560 ft. drlg. 7,005 ft.

Roanoke—Jeff Davis Parish

Humble O. & R. Co. No. 11-B Devilbiss, sec. 11-9s-4w. T.D. 8,842 ft.; 7-in. csg. 8,842 ft.; I.P. 14 B.P.H.; ¼-in. ck.
Humble O. & R. Co. No. 1 Williams, sec. 13-9s-4w. R.U.

Sorrento—Ascension Parish

Pan American Prod. Co. No. 9 United Ld. Co., sec. 15-10s-4e. Drlg. sh. 861 ft.

South Elton—Jeff Davis Parish

Stanolind O. & G. Co.-Amerada Pet. Corp. No. 3-B Calcasieu Natl. Bank, sec. 27-7s-3w. T.D. 9,154 ft.; conditioning hole; 9⅝-in. csg. 8,647 ft.; drlg. sh. 12,430 ft.

Starks—Calcasieu Parish

Capital Oil Co. No. 1 Lutcher-Moore, sec. 24-9s-13w. R.U.

Timbalier Bay—Lafourche Parish

Gulf Oil Corp. No. 4 State, sec. 36-23-21e. R.U.

Sulphur—Calcasieu Parish

Union Sulphur Co. No. 852 fee, sec. 29-9s-10w. T.D. 5,068 ft.; P.B. and sdtrkd.; T.D. 5,193 ft., salt; P.B. 1,703 ft.; T.D. 3,586 ft.; abd.
Union Sulphur Co. No. 858 fee, sec. 29-9s-10w. T.D. 5,027 ft.; P.B.; sdtrkd.; T.D. 5,131 ft.; rng. 7-in. csg.

Valentine—Lafourche Parish

Wm. Helis No. 1 Valentine-Sugars, Inc., sec. 2-17s-20e. T.D. 6,931 ft.; fsg.
Pan American Prod. Co. No. 1-B Community, sec. 58-17s-20e. T.D. 8,160 ft.; 7-in. csg. 7,790 ft.
Pan American Prod. Co. No. 16 Harang, sec. 7-17s-20e. T.D. 7,236 ft.; P.B. and sdtrkd.; T.D. 6,789 ft.; 7-in. csg. 5,710 ft.
Pan American Prod. Co. No. 17 Harang, sec. 9-17s-20e. Drlg. sh. 7,477 ft.

Venice—Plaquemines Parish

Tide Water Oil Co. No. 5 Manhattan Fruit Co., sec. 26-26s-30e. Top oil sd. 7,250 ft.; T.D. 7,300 ft.; P.B. 4,800 ft.; sdtrkd. at 4,813 ft.; cd. oil sd. 7,101-68 ft.; T.D. 7,290 ft.; 7-in. csg. 7,191 ft.
Tide Water Asso. Oil Co. No. 6 Manhattan Ld. & Fruit Co., sec. 26-21s-30e. Cd. sd. S.O. 5,950-65 ft.; cd. oil sd. 7,127-59 ft.; T.D. 7,202 ft.; 7-in. csg. 7,200 ft.; tstg.

Vinton—Calcasieu Parish

M. McLean No. 17 Gray, sec. 35-10s-12w. R.U.
Sutton-Burton No. 1 Calcasieu Natl. Bk., sec. 3-11s-12w. T.D. 4,500 ft.; T.A.

Villa Platte—Evangeline Parish

Continental Oil Co. No. 1 N. H. Hirsch, sec. 44-3s-2e. S.D. 9,040 ft.
Continental Oil Co. No. 1 McDaniels, sec. 44-3s-2e. Drlg. sd.&sh. 8,917 ft.
Continental Oil Co. No. 1 Opelousas, St. Landry Securities Co., sec. 44-3s-2e. R.U.
Continental Oil Co. No. 1 Tate, sec. 44-3s-2e. Drlg. sd. 9,002 ft.
Continental Oil Co. No. 1 T. E. Vidrine, sec. 47-3s-2e. Drlg. sd.&sh. 6,760 ft.

Welsh—Jeff Davis Parish

J. Massart No. 1 L. T. Mathews, sec. 27-9s-5w. T.D. 1,269 ft.; S.D.

Stanolind O. & G. Co. No. 1 W. B. Conover, sec. 20-9s-5w. 13⅜-in. csg. 2,017 ft.; T.D. 7,311 ft.; fsg.

Woodlawn—Jeff Davis County

Union Sulphur Co. No. 2 Calcasieu Natl. Bnk., sec. 12-9s-6w. Drlg. sh.&L. 8,248 ft.

S. LOUISIANA WILDCATS

Acadia Parish

H. E. Dalton No. 1 Setting, sec. 17-7s-1w T.D. 5,106 ft.; P.B. to approx. 500 ft T.D. 3,925 ft.; D.S. stuck.

Humble O. & R. Co. No. 1 Finch, sec. 22-10s-1e. 9⅝-in. csg. 7,474 ft.; drlg. sd. 9,350 ft.

Avoyelles Parish

G. C. Koch et al No. 1 Kelone, sec. 21-2n-3e. 10¾-in. csg. 987 ft.; drlg. sh. 3,428 ft.

Beauregard Parish

Republic Prod. Co. No. 1 Lutcher-Moore Lbr. Co., sec. 10-13w-6s. 10¾-in. csg. 1,015 ft.; drlg. sh. 5,500 ft.

Calcasieu Parish

Shell Pet. Corp. No. 1 Calcasieu Natl. Bk., sec. 18-11s-10w. T.D. 9,073 ft.; abd.

Sun Oil Co. No. 1 Lutcher-Moore Lbr. Co., sec. 1-8s-13w. Drlg. sd. 4,430 ft.

Wheeler Oil Corp. No. 2 Sch. Ld., sec. 1-9s-7w. 15½-in. csg. 46 ft.; S.D. 641 ft.

Cameron Parish

Humble O. & R. Co. No. 1-B Miami Corp., sec. 7-14s-6w. 13⅜-in. csg. 2,150 ft.; cg. S.W. sd. 8,835 ft.

Superior Oil Co. No. 1 Sells, sec. 5-15s-8w. Bldg. drk.

Cameron Parish—Gulf of Mexico

Superior Oil Prod. Co. et al No. 1 State Gulf of Mexico, 3,800 ft. W, 6,200 ft. E of SE cor. of irregular sec. 4-15s-8w 10¾-in. csg. 1,157 ft.; 7⅝-in. csg. 7,166 ft.; T.D. 9,394 ft., sd.; well attempted to blow out; killed; D.S. stk. 8,800 ft.; P.B. 5,500 ft.; to test; flwd. est. 250 B.P.D.; 7/64-in. ck.; S.I.

East Baton Rouge Parish

Austin B. Taylor No. 1 Duplantier, sec. 65-7s-1w. T.D. 6,477 ft.; sd. showing oil; 7-in. csg. 6,472 ft.; I.P. 465 B.P.D.; ⅞-in. ck.; T.P. 1,000 lbs.

Iberia Parish

Texas Co. No. 1 Bayless-Jones, sec. 58-12s-5e. Drlg. sdy. sh. 5,073 ft.

Texas Co. No. 2-B Vermilion Bay, sec. 20-16s-5e. T.D. 9,101 ft.; P.B. and sdtrkd at 5,788 ft.; T.D. 7,020 ft.; P.B. 6,385 ft.; to sdtrk.; T.D. 7,623 ft.; P.B. 7,176 ft.; to sdtrk.; T.D. 7,348 ft.; run csg.

Jefferson Parish

Julius Szodomka No. 1 Carroll, sec. 12-12s-11e. Drlg. sh.&sd. 2,280 ft.

Lafayette Parish

Continental Oil Co. No. 1 Foreman, sec. 36-9s-3e. Drlg. sh. 8,952 ft.

Pointe Coupe Parish

Batchelor Oil Co. No. 1 Hackney, sec 28-3s-8e. 20-in. csg. 117 ft.; 13⅜-in. csg. 2,170 ft.; drlg. S.W. sd. 6,155 ft.

Rapides Parish

J. J. Farrell No. 1 W. P. Aertker, sec. 16-4n-1e. Drk.

St. Bernard Parish

Gulf Ref. Co. No. 3 State Lake, Twp. 12s-15e. Spd.

St. James Parish

Continental Oil Co. No. 1 Realty Operators, sec. 17-12s-17e. R.U.

St. Landry Parish

Nixon & Toombs No. 1 Boagni, sec. 41-6s-4e. Drlg. sh. 1,472 ft.

St. Martin Parish

Carter & Stewart No. 2 Martin, sec. 32-9s-7e. Top salt 4,477 ft.; T.D. salt 4,526 ft.; abd.

Shell Pet. Corp. No. 1 Unit, sec. 11-14s-12e. Cg. sd.&sdy. L. 9,792 ft.

Texas Co. No. 11 St. Martin Ld. Co., sec. 21-8s-7e. Bldg. drk.

St. Mary Parish

Pet. Heat & Power Co. No. 9, sec. 9-13s-9e. S.D. 3,009 ft.

Terrebonne Parish

Fohs Oil Co. No. 1 Bucklev & Bourg, sec. 77-19s-17e. Cg. sd. 9,083 ft.

Fohs Oil Co. No. 1 State, sec. 41-19s-19e. 18⅝-in. csg. 246 ft.; cd. sd. S.G. 6,894-6,915 ft.; T.D. 8,279 ft.; fsg.

Vermilion Parish

Magnolia Pet. Co. No. 1 J. B. Ferguson, sec. 5-12s-2w. R.U.R.

TEXAS

Week Ending March 26

GULF COAST FIELDS

Lockridge—Brazoria County

Gulf Oil Corp. No. 5 Carrie Baker, J. W. Hall Sur. No. 11. Drk.

Gulf Oil Corp. No. 6-A Wilkes and Smith, J. W. Hall Sur. No. 11. T.D. 6,368 ft.; rng. csg.

Hastings Field—Brazoria County

Humble O. & R. Co. No. 12 R. D. Haden, R. Hoppel Sur. Drlg. sh. 4,895 ft.

Humble O. & R. Co. No. 8 W. H. Schindler, H.T.&B. Sur. No. 35. R.U.

Humble O. & R. Co. No. 9 W. G. McDeed, H.T.&B. Sur. No. 27. T.D. 6,098 ft.; comp.; no ga.

Navarro-Humble O. & R. Co. No. 1-E W. F. Beers, Perry & Austin Sur. Drlg. 1,500 ft.

Producers Inv. Co. No. 5 C. H. Alexander, A.C.H.&B. Sur. No. 1. R.U.

Jay Simmons No. 4 C. H. Alexander, H. T.&B. Sur. No. 28. T.D. 6,100 ft.; tstg.

Stanolind O. & G. Co. No. 2 L. B. Bisbee, H.T.&B. Sur. No. 37. Drlg. sh. 4,026 ft.

Stanolind O & G. Co. No. 10 F. N. Brown, H.T.&B. Sur. No. 29. T.D. 6,080 ft.; tstg.

Stanolind O. & G. Co. No. 20 Drake, H. T.&B. Sur. No. 36. R.U.

Stanolind O. & G. Co. No. 15-A H. H. Ford, A.C.H.&B. Sur. T.D. 6,080 ft.; tstg.

Stanolind O. & G. Co. No. 8 Guido, H.T. &B. Sur. No. 36. Drk.

Stanolind O. & G.. Co. No. 6 Matsushita, H. Stevens Sur. T.D. 6,080 ft.; tstg.

Stanolind O. & G. Co. No. 1 R. J. Schmidt, H. Stevens Sur. Drlg. sh. 704 ft.

Old Ocean—Brazoria County

Harrison & Abercrombie No. 5 Bernard, C. Breen Sur. 9⅝-in. csg. 7,000 ft.; T.D. 10,393 ft.; rng. csg.

Harrison & Abercrombie No. 1 Osberne, C. Breen Sur. T.D. 10,387 ft.; rng. csg.

Harrison & Abercrombie Oil Co. No. 1 Troyer and West Texas Abst. Co., C. Breen Sur. Drlg. sh. 10,125 ft.

West Columbia—Brazoria County

Adrian Moore No. 2 Gulf fee, George Tennille Sur. Cg. 5,410 ft.

Frost and Dunnan No. 1 E. S. Parker, Geo. Tennille Sur. Bldg. drk.

Mike Hogg No. 2 Varner, W. Varner Lge. R.U.

Sterling O. & R. Co. No. 1 Munson, G. Tennille Sur. Cg. 5,416 ft.

Texas Co. No. 20-A Abrams, George Tennille Sur. Drlg. sd.&sh. 5,130 ft.

Texas Co. No. 21 Abrams, Geo. Tennille Sur. Drlg. sh. 1,457 ft.

Texas Co. No. 2 Goldman, G. Tennille Sur. T.D. 5,429 ft.; tstg.

Texas Co. No. 7 J. G. Phillips, George Tennille Sur. Drlg. sh.&L. 5,290 ft.

Texas Co. No. 4 T. L. Smith, Geo. Tennille Sur. Drlg. sh. 6,050 ft.

Wallace Oil Co. and others No. 1 Hargrove, G. Tennille Sur. Drlg. sh. 4,620 ft.; no report.

Calhoun—Heyser—Victoria County

Blanco Oil Co. et al No. 9-C Dunwoody, A. Sisneros Sur. Drlg. sh. 1,226 ft.

George Echols No. 5 O. M. Lander, J. E. Galban Sur. T.D. 5,748 ft.; tstg.

Gulf Oil Corp. No. 4-B C. P. Traylor, J. Galban Sur. Drk.

Gulf Ref. Co. No. 3 L. P. Schultz, J. E. Galban Sur. R.U.

Magnolia Pet. Co. No. 7 Lander, J. E. Galban Sur. R.U.

Sinclair Prairie Oil Co. No. 11 W. H. Bennett, A. Sisneros Sur. Drk.

Sinclair Prairie Oil Co. No. 12 W. H. Bennett, A. Sisneros Sur. R.U.

Cedar Point Field—Chambers County

Humble O. & R. Co. No. 1 State, sec. 95. Drlg. sh. 1,803 ft.

Standard Oil Co. of Texas and Salt Dome Oil Co. No. 2 State, sec. 119. Drk.

Seabreeze—Chambers County

Sun Oil Co. No. 1 R. J. Barrow, A. Yarbo Sur. R.U.

Sun Oil Co. No. 1 J. T. White, sec. 118, H.T.&B. Sur. T.D. 8,485 ft.; oil sd.; S.I. for stg.

Silsbee—Hardin County

Humble O. & R. Co. No. 1 B. L. Kirkendall, NE offset to No. 1 Howell. Drlg. sh. 6,912 ft.

Eureka—Harris County

Jack Frazier No. 1 Bollmer & Neimann, J. Reinerman Sur. 10¾-in. csg. 2,540 ft.; T.D. 7,730 ft.; perf. csg. 7,697-7,722 ft.; I.P. 25 B.P.H.; ¼-in. ck.

Jack Frazier et al No. 1 Varner, Realty Co., J. Reinerman Sur. R.U.

Fairbanks—Harris County

H. C. Adams No. 1 J. P. Dawson, W. K. Hamblen Sur. R.U.

Amerada-Stanolind O. & G. Co. No. 1 E. M. White, Geo. Ayers Sur. T.D. 6,895 ft.; perf. csg. 6,842-55 ft.; flwd. 71 bbls. fluid in 3 hrs.; ⅛-in. ck.; tstg.

E. L. Smith and Ownby Drlg. Co. No. 2 L. M. Meyers, J. Ayers Sur. Drlg. sh. 2,364 ft.

H. E. Williams No. 1 A. Vega, G. Williams Sur. 10¾-in. csg. 850 ft.; T.D. 6,836 ft.; 5½-in. csg. 6,835 ft.; perf. csg. 6,822-34 ft.; tstd. S.W.; reperfg. csg.

Friendswood—Harris County

Humble O. & R. Co. No. 1 H. Goodwin, W. K. Smith Sur. T.D. 6,042 ft.; recompleting, due to high gas-oil ratio.

Humble O. & R. Co. No. 4 E. A. Grey, Perry & Austin Sur. T.D. 6,041 ft.; tstg.

Humble O. & R. Co. No. 5 E. A. Grey, Perry and Austin Sur. Drk.

Humble O. & R. Co. No. 1 J. L. Jones, Perry & Austin Sur. Drk.

Humble O. & R. Co. No. 1-B Keisling & Dixon, T. Choate Sur. R.U.

Humble O. & R. Co. No. 2 J. H. Ross, T. Choate Sur. R.U.

Humble O. & R. Co. No. 3 J. J. Settegast, Perry & Austin Sur. Drlg. 5,412 ft.

Humble O. & R. Co. No. 1 E. E. Watson. Drk.

Humble O. & R. Co. No. 2 B. A. Whitcomb, T. Choate Sur. T.D. 6,047 ft.; tstg.

Humble O. & R. Co. No. 1-B O. P. Woodburn, A. Whitlock Sur. Loc.

LaBelle—Jefferson County

Sun Oil Co. No. 3 Broussard-Hebert, B. Blackman Sur. Cg. sh. 8,381 ft.

North Cheek—Jefferson County

Magnolia Pet. Co. No. 4 J. H. Phelan, A. Stivers Sur. R.U.

Hardin—Liberty County

Atlantic Ref. Co. No. 2 W. McMurtry, H. B. Johnson Sur. Drlg. sh. 3,640 ft.

Fohs Oil Co. No. 1 Johnson, H. B. Johnson Sur. Drlg. sh. 6,076 ft.

Jack Frazier No. 2-B Lynott-Buffam, J. Robeson Sur. Drlg. sh. 4,212 ft.

Gulf Oil Corp. No. 1 M. F. Tullos, H. B. Johnson Sur. T.D. 7,628 ft.; rng. csg.

Halliburton Oil Prod. Co. No. 2 Hanchy, H. B. Johnson Sur. Drk.

Humble O. & R. Co. No. 1 Partlow, H. B. Johnson Sur. Drlg. sh. 1,736 ft.

Sun Oil Co. No. 1 A. A. Hisey, H. B. Johnson Sur. T.D. 7,674 ft.; 7-in. csg. 7,644 ft.; comp.; no ga.

Tide Water Associated Oil Co. No. 1 A. Cessena, A. B. Hardin Sur. Spd.

Bay City—Matagorda County

Hamman Explo. Co. No. 2 Crooke, E. Hall Sur. Top sd. 9,660 ft.; tstg.

Hamman Explo. Co. No. 2 G. M. Sloan, J. T. Belknap Sur. Drk.

Pan American Prod. Co. No. 1 Richers, I.&G.N. Sur. X-3. T.D. 9,689 ft.; 7-in. csg. 9,668 ft.; perf. csg. 9,570-87 ft.; swbg.

Smith & McDannald No. 2 Gaines, E. Hall Sur. T.D. 8,165 ft.; 7-in. csg. 8,074 ft.; flwd. 207 bbls. in 24 hrs.; ⅞-in. ck.

Palacios—Matagorda County

Atlantic Ref. Co. & McCarthy No. 3 Foley Ld. Co., L. Goodwin Sur. 7-in. csg. 8,635 ft.; T.D. 8,900 ft.; perf. csg. 8,820-43 ft.; failed to flow.

Sun Oil Co. No. 1 F. K. Robeson, L. Goodwin Sur. Drk.

Orange—Orange County

Gulf Oil Corp. No. 1 O. Duhon, Wm. Dyson Sur. Drlg. sh. 5,956 ft.

Ryan & Thompson No. 1 Walter-McGill, Wm. Dyson Sur. Drlg. sh. 4,136 ft.

Shell Pet. Corp. No. 1 E. V. Loeffler, Wm. Dyson Sur. T.D. 5,967 ft.; tstg.

Union Prod. Co. No. 2 Lutcher-Moore, Dyson Sur. 9⅝-in. csg. 5,162 ft.; drlg. sh. 6,496 ft.

Segno—Polk County

Gulf Oil Corp. No. 2 Ragan, I.&G.N. Sur. 15. T.D. 6,704 ft.; 9⅝-in. csg. 5,587 ft. drlg. sh. 8,045 ft.

Gulf Oil Corp. No. 6 Wing, I.&G.N. Sur. No. 15. T.D. 5,190 ft.; comp.; no ga.

Humble O. & R. Co. No. 8-B Kirby, M. Victor Sur. Drlg. sh. 5,791 ft.

Spurger—Tyler County

Republic Prod. Co.-Houston Oil Co. No. 9 Hurd, N. Hurd Sur. R.U.

GULF COAST WILDCATS

Brazoria County

W. H. Christie et al No. 1 J. J. Settegast, F. Green Sur. T.D. 6,543 ft.; abd.

Albert Plummer No. 1 G. C. Street, H. M. Hunter Sur. 10¾-in. csg. 1,232 ft.; T.D. 6,355 ft.; abd.

Pure Oil Co. No. 1 Clemons State Farm S. F. Austin 7⅛ Lge. 7⅝-in. csg. 1,955 ft.; T.D. 6,515 ft.

Brazos County

Pet. Heat & Power Co. No. 1 Minnie C. Dunn, J. M. Barrera Sur. Drk.

Burleson County

Red Bank Oil Co. No. 1 Coffield, E. Sante Sur. Drlg. sh. 2,896 ft.

Chambers County

Geo. Anderson No. 1 Julia Casey, W. D. Smith Sur. Loc.

A. A. Cameron et al No. 1 White, Solmon Brill Sur. 10¾-in. csg. 1,500 ft.; drlg. sh. 3,626 ft.

Leverne Decker et al No. 1 Broussard Trust, sec. 30, H.T.&C. Sur. 10¾-in. 740 ft.; T.D. 7,580 ft.; abd.

Fort Bend County

Lomack Oil Co. No. 1 G. W. Armstrong, S. Miller Sur. No. 2. Drlg. sh. 2,936 ft.

J. R. Spencer No. 1 H. Boyle, Thomas Westfall Sur. Drlg. sh. 3,136 ft.

Galveston County

Sun Oil Co. No. 1 Cade, A. Dickinson. Bldg. drk.; M.I.R.

Harris County

Chapman Mineral No. 1 O. Harris, Wm. Jones Sur. R.U.

W. S. Howell No. 1 Root, A. McCormick Sur. S.D. 2,807 ft.

O. W. Killam No. 1 J. J. Sweeney Est., G. Williams Sur. Drlg. sh. 5,425 ft.

West Prod. Co. No. 1 G. W. Sowden, J. Lindsey Sur. Drlg. sh. 4,936 ft.

Jasper County

John Mayo No. 1 Cartwright, Legrande Sur. M.I.M.

Jackson County

Sam G. Harrison No. 1 J. Weodner, J. Williams Sur., Abst. 267. T.D. 5,346 ft.; abd.

Humble O. & R. Co. No. 1 J. R. Davis, I.&G.N. Sur. No. 20, Blk. 150. Drk.

Magnolia Pet. Co. No. 1 West Ranch, R. Musquez Sur. T.D. 8,527 ft.; abd.

H. J. Porter No. 1 J. W. Faust, Peter White Sur. T.D. 5,170 ft.; perf. csg. 2,652-57 ft.; I.P. 177 B.P.D.; ⅞-in. ck.; T.P. 225 lbs.; C.P. 330 lbs.

Jefferson County

I. E. Harwell No. 1 State, Gulf of Mexico. T.D. 5,840 ft.; D.S. stk.; pulled in two; S.D.

Humble O. & R. Co. No. 1 State, Gulf of Mexico, sec. No. 8. Spd.

Matagorda County

J. K. Dorrance No. 1 M. Adamcik, I.&G. N. Sur. No. 1. Drlg. sh. 2,556 ft.

Pierce Est. et al No. 1 Paul Kruger, Nel. C. Warren Sur. T.D. 7,383 ft.; P. B.; sdtrkd.; S.D. 6,708 ft.

Sun Oil Co. No. 1 Fred Robbins. C. H Vandeveer Sur. T.D. 10,160 ft.; well tried to blow out; R.U. to rework.

Polk County

C. E. Gates No. 2 I. O. Jackson, J. W. Abbey Sur. Drk.

Wharton County

H. C. Cockburn et al No. 1 Hudgins, Mudoon Sur. No. 1. T.D. 7,530 ft.; abd.

Strake Pet. Corp. et al No. 1 W. N. Poole, H. J. Fry Sur. 10¾-in. csg. 1,484 ft.; drlg. sh. 2,430 ft.

S. W. TEXAS WILDCATS

Atascosa County

W. M. Allison No. 1 Nieschwietz, J. De La Garza Sur. 216. S.D. 250 ft.

S.W.R. Corp. No. 1 Miller, J. Neill Sur. S.D. 435 ft.

Bastrop County

J. W. Bibb No. 1 Lentz, F. Wilkenson Sur. Top Austin Chalk with odor of oil 2,530 ft.; 5½-in. csg. 2,443 ft.; S.D. 2,550 ft.

R. C. Franklin No. 2 Yarrington, Jose Manuel Bangs Sur. S.D. 110 ft.

Humble O. & R. Co. No. 1 Hellsman, J. Cunningham Sur. 16-in. csg. 150 ft.

Western Gulf Pet. Co. of Houston, Martin Wells Sur. Drlg. sh. 850 ft.

Bee County

Luling O. & G. Co. No. 1 Page, B. Q. Hadley Sur. Drlg. sh. 4,000 ft.

Union Prod. Co. No. 55 Ray, Geo. Kerr Sur. T.D. 3,879 ft.; abd.

Bexar County

Culver & Bender No. 1 Peterson, H. Virm Sur. T.D. 1,285 ft., L.; swbd. some oil; hole bridged.

Ralph Fair No. 1 Godda, J. H. Pickens Sur. T.D. 1,227 ft.; bailing.

Harrison et al No. 1 Schuwerth, Jose Antonio De La Garza Sur. S.D. 1,034 ft.

Hikok & Reynolds No. 1 Elvert, Thomas York Sur. T.D. 1,670 ft.; 7-in. csg. 1,142 ft.; drlg. S.W. sd. 2,896 ft.

Joe H. Noake No. 1 Oppenheimer, W Miller Sur. No. 180. 10-in. csg. 17 ft.; drlg. 170 ft.; no report.

Chas. Persyn No. 1 fee, Wm. Lindsey Sur. T.D. 1,703 ft.; abd.

LEGAL

U. S. Department of the Interior, General Land Office, Washington, D. C. Notice is hereby given that the following lands are offered to the responsible qualified bidder of the highest bonus per acre, for leasing pursuant to section 17 of the act of February 25, 1920 (41 Stat. 437), as amended by the act of August 21, 1935 (49 Stat. 674), at the royalty rate scale in the lease form shown in Circular 1386: Carterville-Sarepta Oil and Gas Field, lot 2 Sec. 2, lot 4 Sec. 4, lots 3 and 4 Sec. 5, T.22 N., R. 11 W., SE¼ NW¼ Sec. 31, T. 23 N., R. 11 W., La. M., 99.77 acres; Rodessa Oil and Gas Field, Unit No. 3, NW¼ SE¼ Sec. 5, T. 23 N., R. 15 W., 28.93 acres; Unit No. 4, SW¼ NE¼ Sec. 2, T. 23 N., R. 16 W., 27.96 acres. The sale will be held in the Federal Court Room, Post Office Building, Shreveport, Louisiana, at 12:00 noon on April 11, 1938. The successful bidder must deposit on the day of the sale a certified check on a solvent bank, or cash, for 1/5 of the amount of each bid, and file the showing of qualifications to receive a lease required by section 7 of General Land Office Circular No. 1386. The remaining 4/5, together with the annual rental in advance, at the rate of $1 per acre, must be paid prior to the issuance of the lease. The bidders are warned against violations of the provisions of section 59 of the U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids at the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

Caldwell County

Mac-Wag-Tree Oil Co. No. 1 Roberts, W House Sur. 5¼-in. csg. 2,517 ft.; T.D 2,713 ft.; swbd. well; flwd. sulfur wtr. P.B. to test.
Mencill Pet. Co. No. 1 J. Wallinger. Gedeon Pace Sur. Drlg. 1,567 ft.; no report.
C. R. Richardson No. 1 Schowe, T. Maxwell Sur., Abst. 188. R.U.

Cameron County

Saxet Prod. Co. No. 1 Port Isabel Irrig Co. Sur. 30. Drk.

Dimmitt County

Texas & Maryland Corp. No. 1 McKnight, Blk. 13, sec. 23. Base of Austin Chalk 5,201 ft.; top Georgetown L. 6,120 ft.; T.D. 7,116 ft.; S.D. for csg.

Duval County

Atlantic Ref. Co. No. 1 Frank Gravis, E. Gravis Sur., sec. 88. 10¾-in. csg. 747 ft.; T.D. 5,833 ft.; abd.
Conroe Drlg. Co. No. 1 A. Trevino, J Poitevent Sur., sec. 1. S.D. 4,750 ft.
Corpus Christi Ref. Co. No. 1 Parr, B. S.&F. Sur. 303. R.U.
Frank Gravis No. 1 Megargal, J. Boyles Sur. 10-in. csg. 500 ft.; drlg. plug.
Magnolia Pet. Co. No. 1 Duval Co. Rnch. Co., C.C.S.D.&R.G.N.G. Sur., sec. 87. Drlg. sh. 857 ft.
Magnolia Pet. Co. No. 1 W. K. Hoffman, sec. 111, S.A.&M.G. Sur. Drlg. sh. 4,712 ft.
Mills Bennet-Stanolind O. & G. Co. No. 1-A Yates, J. Poitevent Sur. No. 321. 10¾-in. csg. 196 ft.
Pet. Prod. Co. No. 1-B Worden, J. L. Saen Sur. A-162. T.D. 1,503 ft.; abd.
Rowan & Hope No. 1 C. K. Gravis, sec. 90. Rng. surf. csg.; T.D. 500 ft.
Sun Oil Co. No. 1 Ross, A.B.&M. Sur. M.I.M.
P. T. Wright No. 1 Hyatt, Sweden Farm Lots Subd. R.U.

Edwards County

Dan Auld No. 1 Henderson, sec. 46, Blk E. 7-in. csg. 1,865 ft.; drlg. L. 4,810 ft.

Goliad County

Windward Oil Co. No. 1 Dreier, B.S.&F. Sur. No. 7. 10-in. csg. 1,000 ft.; T.D. 3,637 ft.; D.S.T. 3,632-37 ft.; blew out while drlg. 5,530 ft.; rng. wild; killed; B.P. to sdtrk.

Guadalupe County

Benstrasser No. 1 Eickenroht, A. Marrs Esnaurrezar Sur. R.U.
E. A. Hearn et al No. 1 Dudelof, Jas. A. Clements Sur. S.D. 720 ft.
N. G. Spiller No. 1 Wright Highsmith. T.D. 2,168 ft.; 5½-in. csg. 2,912 ft.

Hidalgo County

Gulf States Oil Co. No. 1 Cardenas, Juan Jose Balle Sur. 10¾-in. csg. 1,689 ft.; drlg. sh. 6,935 ft.
Hidalgo Prod. Co. No. 1 Daskam Corp., Porc. 45, Blk. 34. T.D. 1,507 ft.; run surf. csg.

Jim Hogg County

F. S. Adams No. 1 Martinez, sec. 623. Drlg. 1,927 ft.

Jim Wells County

E. Calloway No. 1 Garcia, R. E. L. King Sur., sec. 54. Drlg. sh. 4,712 ft.
Earl Calloway No. 1 Garcia, King Sur. Spd.
H. H. Howell et al No. 1 Lindsey & Reed, Lavaca Gr. Sur. Tstd. S.W. on D.S.T. 3,510 ft.
Magnolia Pet. Co. No. 8 Seeligson, A. Ramerix Sur. 13⅜-in. csg. 1,206 ft.; 9⅝-in. csg. 6,155 ft.; T.D. 6,593 ft.; rng. csg. to test.
Homer Presnall et al No. 1 Banker Mortgage Co., Jose Maria Garcia Sur. Drlg. sh. 2,512 ft.
Rowan & Hope No. 2 Adams, T.&N.O. R.R. Sur. T.D. 3,252 ft.; perf. csg. 3,-215-20 ft.; comp.; no ga.

Kleberg County

Pure Oil Co. et al No. 1 State Ld., Tr. 68, Laguna Madre Bay, Lse. No. 826 Dredging canal.

Lee County

Hiecousse Oil Co. No. 1 Sanders, J. Vin Roeder Sur. Drlg. clay 4,360 ft.

Live Oak County

James Chew No. 1 Alma McNeil, Alexander Parks Sur. 7-in. 5,076 ft.; T.D. 5,290 ft.; perf. csg. 5,078-79 ft.; comp. as gas well.
Culton et al No. 2 Wedding, Bridget Houghey Sur. T.D. 2,805 ft.; abd.
Louis Franklin No. 1 Russell, John Hefferman Sur. R.U.
Karotkin & Richardson No. 1 Pape, Wm. R. Conner Sur. Cg. S.W. sd. 2,-407 ft.
Ray L. Martin No. 1 Adams, J. Buchannan Sur. T.D. 965 ft.; (cor.).
J. I. Newton No. 1 George West Est., Airy Pieratt Sur. No. 129. Drlg. rk. 1,959 ft.
J. P. Payzor No. 1 San Antonio Joint Stock, J. J. Roberts No. 1 Mahone. S.D. 2,000 ft.; abd.
V. G. Schimmel et al No. 1 Geo. West, G. L. Haas Sur. S.D. 210 ft.
Unit Pet. Co. No. 1 Terrell, Mark Kellely Sur., Abst. 20. Cg. 1,000 ft.

McMullen County

Duncan Drlg. Co. No. 1 Martin Henry, sec. 6. S.D. 707 ft.

Medina County

J. W. Cromwell No. 1 J. W. Tondre, I. J. Rogers Sur. Drlg. sh. 320 ft.
Ewing Oil Co. No. 1 Riff Sur. 42. Cg. Serp.; good show oil 580 ft.
J. R. Trentman et al No. 1 Carle Merc. Co., V. A. Johnson Sur. Cg. L. 1,860 ft.

Milam County

Texedo Oil Co. No. 1 Graham, Charles Cornea Sur. Logged S.O. 1,135-36 ft.; cg. L. 1,714 ft.
Texedo Oil Co. No. 1 Paul Garves, C. Robertson Sur. S.D. 1,170 ft.

Nueces County

Corpus Christi Ref. Co. No. 1 J. R. Howington, O. and M. Oliver Sur. No. 156. 10¾-in. csg. 527 ft.; T.D. 5,385 ft.; prep. to sdtrk.
Renwar Oil Corp. No. 1-A Kennedy, D. Martinez Sur. Drlg. sh. 4,867 ft.
Richardson Pet. Co. No. 2 H. B. Baldwin, E. Villareal Sur. No. 1. Drlg. sh. 7,410 ft.

Refugio County

Barnsdall Oil Co. No. 1 C. H. Fagan, Nicholas Fagan. T.D. 6,710 ft.; abd.
Hogan Oil Co. No. 2 Kelly, J. Powers Sur. Cg. sd.; gas odor 5,812 ft.
H. J. Porter et al No. 1 Lambert, J. Powers and Hewitson Sur. R.U. and S.D.

San Patricio County

A. L. Bob No. 2 Green, T. T. Williamson Sur. S.D. 7,100 ft.
Humble O. & R. Co. No. 1 Smith and Talbert, Lot 2, sec. 37. Drlg. sh. 2,-314 ft.
G. E. Smith No. 1 French, Henry S. Day Sur. S.D. 5,713 ft.

Starr County

J. L. Collins No. 1 Francisco B. Guerra, Santa Cruz Gr. T.D. 6,609 ft.; well blew out; rng. wild; showing gas.
C. H. Lewis No. 1 Guerra, Juan Leal Sur. Drlg. 725 ft.
Scaraborough et al No. 1 Haden, Jose De La Garza Sur. R.U.
Sun Oil Co. No. 2-D Guerra, La Sacatosa Gr., 2 mi. SW of Cuevitas field. Drlg. sh. 2,214 ft.

Travis County

Texas Empire Trading Co. No. 1 E. E. Jourdan, Santigo Del Valle Gr. Drk.

Victoria County

W. V. Bowles No. 2 Robertson, T. C. Burnham Sur. Loc.
Portilla Drlg. Co. No. 1 P. H. Welder, S.A.&M.G. Sur. T.D. 6,520 ft.; abd.
Superior Oil Co. and L. A. Gillespie No. 1 J. Carroll, J. F. Johnson Sur. Drlg. sh. 4,310 ft.

Webb County

C. C. Bonner No. 1 Lewis, W. P. Rutledge Sur. 460. Loc.
French Oil Co. No. 4 Benavides, G.C.S. D.&R.G.N.G. Sur. 1121. Drlg. 1,709 ft.
Gilcrease Oil Co. No. 1 Trofton, M. Lopez Sur. 282 ft. 10¾-in. csg. 46 ft.; T.D. 1,945 ft.; abd.
W. S. Hill No. 1 Adami, A.B.&M. Sur. 345. Core sd. 1,047 ft.

Wilacy County

Magnolia Pet. Co. No. 1 Armendais, San Juan DeCarricitos Gr., Sh. 4. T.D. 9,-643 ft.; rng. 8⅝-in. csg.
Salvieja Oil Corp. No. 2 Garcia Ld. Co. Blk. 118. Drlg. sh. 7,812 ft.

Zapata County

R. B. Bryant No. 1 Flores, La. Huerta Sur. Drlg. sdy. sh. 1,337 ft.
Falcon Oil Co. 1½ Aquire, Sh. 28-A. T.D. 2,274 ft.

EAST TEXAS

(Border Counties)

Rodessa—Cass County

Bay Oil Co. No. 2 E. Parker, G. Crowder Sur. Set 7-in. csg. 6,010 ft.; tstg. 6,068 ft.
G. H. Chamblee No. 1 White & Walker, R. Potter Sur. Cg. 6,061 ft.

Bowie County

King Oil Corp. No. 1 Watts, Geo. Brinlee Sur. Rebldg. drk. 4,000 ft.

Cass County—Other

Vincent Hughes No. 1 P. C. Lyster, Bateman Sur. T.D. 4,463 ft.; D.&A.

Harrison County

Ark.-La. Gas Co. No. 1 C. M. Abney, E. Little Sur. T.D. 4,820 ft.; set 7-in. csg. 2,350 ft.; drlg. 3,326 ft.

Marion County—Rodessa

Ark.-La. Gas Co. No. 1 Hill, Gillespie Sur. Drlg. L. 4,880 ft.
Arkansas-Louisiana Gas Co. No. 1 Hollands, Hanks Sur. Set 7-in. csg. 6,092 ft.; T.D. 6,121 ft.; P.B. 6,112 ft.; tstd. S.W.; perf. 7-in. csg. 6,090-95 ft.; tstd. S.W. and S.O.&G.; sqzd. 6,121-6,100 ft.; drld. out to 6,106 ft. and tstd. dry; acdzd. 1,500 gal.; swbg. into pits.
Ark.-La. Gas Co. No. 2 Holland, Hanks Sur. Drlg. L. 3,181 ft.
Ark.-La. Gas Co. No. 1 Howard, Thos. Gillespie Sur. Set 7-in. csg. 6,000 ft.; T.D. 6,030 ft.
Ark.-La. Gas Co. No. 1 Pitts, C. Lockhart Sur. Hill sd. 5,918-21 ft.; tstd. est. 30,000,000 ft. gas; 300 ft. of fluid in hole; B.H.P. 2,400 lbs.; S.I.
Dunn & Fisher No. 1 Neilson, Gentry Sur. Drlg. sh.&L. 5,958 ft.
Dunn & Fisher No. 1 G. F. Whitfield, Bennington Sur. Drlg. L. 5,890 ft.
Geo. Echols No. 2 Whitfield, Bennington Sur. Set 16-in. csg. 61 ft.; W.O.C.
Gulf Oil Corp. No. 2 Grubaugh, Coy Sur. Drlg. sh. 1,581 ft.
Gulf Oil Corp. No. 4-A Henderson, Bennington Sur. Drlg. 2,140 ft.
Heyser, Heard & Clardy No. 1 Brantley, Bennington Sur. Set 5½-in. csg.; T.D. 6,018 ft.
Heyser, Heard & Clardy No. 2-B Henderson, Ewing Sur. Drlg. sh.&L. 5,-590 ft.
Ohio Oil Co. No. 1 Mosley, Francis Sur. R.U.
Phillips Pet. Co. No. 1 Benefield, Hanks Sur. Top Gl. 6,018 ft.; 7-in. csg. 6,117 ft.; T.D. 6,125 ft.
Phillips Pet. Co. No. 1 Henderson, Gillespie Sur. Cg. 5,967 ft.
J. C. Robbins et al No. 1 J.&N.W. Ry., Bennington Sur. Drlg. sh.&L. 5,139 ft.
Shell Pet. Corp. No. 1 Schluter, W. Smith Sur. Drlg. sh.&L. 4,370 ft.
Shell Pet. Corp. No. 1 Whelan, Thos. Gillespie Sur. Set 5½-in. csg. 5,966 ft.; T.D. 5,993 ft.
Union Prod. Co. No. 6 Hutchinson, Coy Sur. Drlg. anhy.&sh. 5,823 ft.
Union Producing Co. No. 7 Hutchinson, Coy Sur. Drlg. sh.&L. 4,272 ft.

Panola County

Texas Co. No. 1 Claude Adams, T. Cox Sur. T.D. 5,940 ft.; set 9⅝-in. csg.; drlg. 6,437 ft.

Shelby County

Joe Burnham No. 1 George, Tutt Sur. Drlg. 3,466 ft.

WEST TEXAS WILDCATS

Andrews County

J. Donnelly et al No. 1 University, sec. 16, Blk. 14, University Sur. Moving in rotary 190 ft.
Humble O. & R. Co. No. 1 Kuykendall, sec. 24, Blk. 46-A, P.S.L. Sur. Tstg. 4,511 ft.
Rogers & Rogers No. 1 O. B. Holt, P.S.L. Sur. Prep. drill deeper.
Seaboard Oil Corp. No. 1 Munger-Nix, sec. 1, Blk. A-4, P.S.L. Sur. S.I. 5,426 ft.
Seaboard Oil Corp. No. 1 Thornberry, sec. 8, Blk. 42-A, P.S.L. Sur. Drlg. 2,175 ft.
H. C. Wheeler No. 1 T. M. Gardner, sec 15, Blk. A-35, P.S.L. Sur. Drlg. 2,140 ft.

Bailey County

Duffey & Etz No. 1 Enochs, Tract 66 League 182, Floyd Co. School Lands Sur. Drlg. new hole from 4,035 ft.

Brewster County

F. C. Dodson No. 1 Texas American Synd., sec. 66, Blk. 10, G.H.&S.A. Sur. R.U. S.T. 7,751 ft.
Storey No. 1 Wilson, sec. 3, Blk. 212, T.& St.L. Sur. S.D. 2,545 ft.

Cochran County

Texas Co. No. 1 Mallett Ld. & Cattle Co., sec. 7, Blk. G, P.S.L. Sur. Drlg. 4,070 ft.

Coke County

Barnett Pet. Co. No. 1 J. R. Mims, sec. 39 Blk. W, T.&P. Sur. S.D. for 5-in. 1,860 ft.
H. E. Ogden et al No. 1 Rawlins, sec. 390 Blk. B-21. S.D. for line 2,800 ft.

Concho County

Barnett Oil Dev. Co. No. 1 Sims, Abst. 851, Carl Thiele Sur. S.D. 162 ft.
Sam Murray No. 1 R. G. Armor, sec. 105, T.&N.O. Sur. S.D. 495 ft.

Cottle County

Wilcox O. & G. Co. No. 1 Richards et al, sec. 761, Blk. Y, W.&G. Sur. S.D. 275 ft.

Crockett County

W. L. Bradley et al No. 1 Hoover, sec. 1, Blk. 1. Drlg. 600 ft.
Choate & Hogan No 1. University, sec. 17, Blk. 14, University Sur. Run. 7-in. 1,467 ft.
Moore Bros. No. 1 Perner, sec. 37, Blk. 2, I.&G.N. Sur. Drlg. 9,086 ft.
J. N. Simpson No. 1 Hoover, G.C.&S.F. Sur. Drlg. bridge 1,931 ft.
Stewart & Cormas No. 1 Hoover, sec. 1, Blk. FF, B.B. Sur. Tstg. 1,931 ft.
W. F. Yates No. 1 Hoover, sec. 6, blk. 1, G.C.&S.F. Sur. Sp.&sd.

Culberson County

Grisham & Hunter No. 1 fee, sec. 14, Blk. 42, P.S.L. Sur. Drlg. 498 ft.
Grisham Hunter No. 1 Caldwell, sec. 14, Blk. 42, P.S.L. Sur. D.&A. 550 ft.
Harry J. W. Nichaus No. 1 C. M. Caldwell, sec. 15, Blk. 109, P.S.L. Sur. Fsg. 595 ft.

Dickens County

J. F. Marrisey No. 1 I. J. McMahan, sec. 319, Blk. 1, H.&G.N. Sur. S.D. 350 ft.

Ector County

Melhoan Drlg. Co. No. 1 Gulf Blakeney. Cg. 4,118 ft.
Stogner et al No. 1 Hendrick, sec. 4, Blk. 43, T.&P. Sur. Drlg. 1,095 ft.
L. H. Wentz Oil Co. No. 1-B Parker. P.B. 4,210 ft.
Wentz Oil Co. No. 2-D Parker. S.D.O. 4,802 ft.; C.O. 800 ft.; O.I.H.

Edwards County

Lyles & Dan Auld No. 1 Henderson, H.E. &W.T. Sur. S.D. 3,200 ft.
Richmond Drlg. Co. No. 1 Brown, G.W. T.&P. Sur. S.D.O. 5,750 ft.

El Paso County

Tri-State Oil Co. No. 1 Kinkel. Running 4-in. 3,571 ft.

Fisher County

Daniel & Rhodes No. 1 Nichless, Geo. W. Lawrence Sur. S.D. 3,340 ft.
General Crude Oil Co. No. 1 Morrow, sec. 185, Blk. 2, H.&T.C. Sur. Drlg. 3,-537 ft.
S. & D. Daube and Forrest Dev. Co. No. 1 A. C. Bennett, sec. 51, Blk. 2, H.&T.C. Sur. Loc.

Floyd County

Mills Bennett No. 1 T. Montgomery, F. J. Latham Sur., 6 mi. S of Floydada. Drlg. 3,100 ft. by side whipstock.

Gaines County

Amerada Pet. Corp. No. 1 R. W. Robertson, sec. 196, Blk. G, W.T.R.R. Sur. Comp.; 146 B.O.P.D.
Continental No. 1-45 Moore, sec. 45, Blk. AX, P.S.L. Sur. Tstg. 4,975 ft.
Eastland Oil Co. No. 1 R. C. Dunbar, sec. 24, Blk. A-12, P.S.L. Sur. M.I.M.
M. B. K. Drlg. Co. No. 1 A. L. Wasson, sec. 52, Blk. AX, P.S.L. Sur. Fsg. 176 ft.
Shell Pet. Corp. No. 1 M. B. Robinson, sec. 344, Blk. G, C.C.S.D.&R.G.N.G. Sur. D.&A. 5,330 ft.

Garza County

Gulf Oil Corp. No. 1 Swanson, sec. 25, Blk. 2, H.&G.N. Sur. Drlg. 2,216 ft.

Glasscock County

O. B. Greathouse No. 1 Burns, sec. 221, Blk. 29, W.&N.W. Sur. M.I.S.T.
O. B. Greathouse No. 1-211 Burnes, sec. 211, Blk. 29, W.&N.W. Sur. Loc.

Hockley County

Gulf Oil Corp. No. 1 M. G. Gordon, sec. 13, Blk. X, P.S.L. Sur. Tstg. 5,050 ft.
Gulf Oil Corp. No. 1 Mallett Ld. & Cattle Co., sec. 6, Blk. X, P.S.L. Sur. Drlg. 5,070 ft.
Honolulu Oil Co. No. 1-51 Dorthy Slaughter, Labor 51, League 37, Zavalla Co. Sch. Lds. Tstg. 4,970 ft.
Honolulu Oil Co. No. 1-77, Labor 77, League 37, Zavalla Co. Sch. Lds. Rng. 7-in. 4,830 ft.

Howard County

Lockhart Oil Co. No. 1 Hussinger, sec. 67, Blk. 29, W.&N.W. Sur. P.B. 2,875 ft.
W. F. McDermott et al No. 1 Lucas, sec. 18, Blk. 29, Twp. 1n, T.&P. Sur., 5 mi. N of Dodge pool. Drlg. 3,077 ft.
Moore Bros. No. 1 W. P. Edwards, sec. 44, Blk. 30, T.&P. Sur. Drlg. 1,360 ft.
Texas Co. No. 1 H. H. Wilkinson, sec. 32, Blk. 34, T.&P. Sur. Drlg. 626 ft.

Hudspeth County

Haymon Krupp Oil & Ld. Co. No. 1 Thaxton, SE¼ sec. 34, Blk. 74, Twp 6. Drlg. 4,178 ft.; S.G.
Haymon Krupp No. 1 Briggs, sec. 24, Blk. 73, Twp. 7, T.&P. Sur. U.R.

Jeff Davis County

Joiner Oil Corp. No. 1 Jones-Coffield. U.R. 3,450 ft.

Kent County

Thad A. Bryant Jr. No. 1 Haggins et al, sec. 118, Blk. 1, H.&G.N. Sur. Bldg. drk.
Thad A. Bryant, Jr., No. 1 House, sec. 10, Blk. 1, H.&G.N. R.R. Sur., 6,000-ft. test. S.D. 200 ft.

Kerr County

A. E. Edmiston et al No. 1 J. H. Saul, sec. 47, T.W.N.G. Sur. Spdg.

Lamb County

Toddie L. Wynne, Tr. No. 1 Neuenschwander, Labour 1, League 660, State Cap't. Lds. D.&A. 5,503 ft.

Loving County

Barnett Pet. Co. No. 1-A Johnson, sec. 2, Blk. 57, Twp. 1, T.&P. Sur. Drlg. 3,-900 ft.
Bryant-Caraway et al No. 1 House, Pre-Emption Sch. Lds., sec. 10. Setting surface csg.
Carpenter & Grierson No. 1 Mrs. Bennie Barnes, sec. 22, Blk. C-25, P.S.L. Sur. Loc.

Lynn County

John L. Baldridge No. 1 Alma Lbr. Co., sec. 151, H.E.&W.T. Sur. S.D.O. 4,415 ft.

McCulloch County

Westbrook et al No. 1 Johnson, A. Nevendorf Sur. Comp.; T.D. 1,200 ft.

Martin County

Harris-Anderson Oil Corp. No. 1 Mollie Robinson, sec. 33, Blk. 38, T.&P. Sur. S.D. 4,189 ft.

Menard County

G. A. Clements No. 1 Murchison, sec. 80. B.S.&S. Sur., 8 mi. E of Menard. S.D.O. 1,320 ft.
C. D. Haggerty No. 1 Callon, sec. 36, Jim Franz Sur. S.D. 200 ft.

Pecos County

Harry Baker et al No. 1 White & Baker, sec. 53, Blk. 194, C.C.&S.F. M.I.M.
J. J. Dorr et al No. 2 Payton, sec. 99, Blk. 8, H.&G.N. Sur. Cellar and pits.
Ed Falney No. 1 Trees, sec. 63, Blk. 8, H.&G.N. Sur. Fsg. 2,055 ft.
Magnolia Pet. Co. No. 1 McKee. Pulling 7-in. 5,444 ft.
E. R. Minshall et al No. 1 Haynie, sec. 28; Blk. 146, T.&St.L. Sur. M.I.M.
S. Thompson No. 1 Elsinore Cattle Co., sec. 54, Blk. D, G.C.&S.F. Sur. Fsg. 7,212 ft.
Trans-Pecos Oil Co. No. 1 Gallagher, T.&P. Sur. Drlg. 1,940 ft.
Trans-Pecos Oil Co. No. 3-A Papham, G.H.&S.A. Sur. U.R. 2,024 ft.
Wilcox O. & G. Co. No. 1 Serf, sec. 27. Blk. 130, T.&St.L. Sur. Drlg. 3,085 ft.

Presidio County

L. C. Brite No. 4 fee, C NW¼ sec. 113, Blk. 12, G.H.&S.A. Sur. Drlg. 4,420 ft.

Reeves County

Barnett Pet. Corp. No. 1 Ely, sec. 38, Blk. 71, P.S.L. Sur., 12 mi. NW of Toyah. S.D. 4,223 ft.
Grisham Hunter Corp. & N. A. Grisham No. 1 Geo. Daniel, sec. 40, Blk. 58, T.&P. Sur. Run. 10-in. 905 ft.
Ohio Oil Co. No. 1 Papham. sec. 18, Blk. 54, T.&P. Sur. Drlg. 2,280 ft.

Runnels County

Beaudoin & Cannon No. 1 Geisecke, J. Hughes Sur. Prep. deepen 2,503 ft.
E Z Oil Co. No. 1 B. Fletcher, E. C. Goon Sur. T.D. 4,394 ft.; P.B. to 4,360 ft.; S.D.O. 4,384 ft.
Stevens & Glober No. 1 Fowler, sec. 150, E.I.R.R. Sur. Drlg. 1,200 ft.

Schleicher County

J. M. Cooper No. 2 B. Page, sec. 40, Blk. L, G.H.&S.A. Sur. S.D. 5,004 ft.
Tex-Tor Oil Corp. No. 1 Judkins & Spencer, C of SW¼ sec. 33, Blk. A, A.&B. Sur. Drlg. 6,320 ft.

Scurry County

Robinson Drlg. Co. No. 1 Martin, sec. 147, H.&T.C. Sur. S.D. 3,513 ft.
T. G. Shaw Oil Co. No. 1 First Natl. Bank. Fsg. 2,420 ft.

Sterling County

Loffland Bros. & Moore Bros. No. 1 D. D. Parramore, sec. 23, Blk. 2, H.&T.C. Sur. R.U.S.T.
J. W. Sward No. 1 Brennand, sec. 107 Blk. 2, H.&T.C. Sur. Rng. 10-in. 968 ft.

Stonewall County

Bert Fields No. 1 J. M. Lee, J. E. Pierson Sur. Spd.&S.D.
General Crude Oil Co. No. 1 J. D. Smith, sec. 371, Blk. 2, H.&T.C. Sur., 12 mi. N Rotan. Drlg. 3,450 ft.
Swanson & Parriott No. 1 H. T. Carlisle. sec. 293, Blk. D, H.&T.C. Sur. R.U.S.T. 3,345 ft.

Sutton County

A. A. Basse and S. J. Sackett No. 1 W. A. Miers, sec. 54, Blk. 14, T.W.&N.G. Sur. S.D. 55 ft.
Ordovician Oil Co. No. 1 Evans, sec. 1, L. Stubblefield Sur., 32 mi. SE of Sonora Comp.; T.D. 4,188 ft.

Terrell County

D. & S. Oil Co. No. 1 Sam Bell. S.D. 960 ft.

Tom Green County

Humble O. & R. Co. No. 1 Lewis & Ward law, sec. 5, Blk. 17, H.&T.C. Sur. Cg. 7,101 ft.
Southern Cross Oil Co. No. 1 J. W. Wilson, sec. 30, Blk. H, A.B.&M. Sur. Loc.
Spinner No. 1 Reed, Mason Ferry Ranch Sur. S.D.O. 3,900 ft.

Upton County

Holland & Maverick No. 1 Halff, sec. 6, Blk. A, C.C.S.D.&R.G.N.G. Sur. Drlg. 2,581 ft.
W. D. Riser et al No. 1 King Ranch Oil & Lignite Co., sec. 8, Blk. 3, M.K.&T. Sur. S.D. 730 ft.
Rutter et al No. 1 Egolb, sec. 5, J. H. Gibson Sur. Blg.; T.D. 3,294 ft.; S.D.O. 3,295 ft.
J. S. Pitman No. 1 D. Elder, C.C.S.D.& R.G.N.G. Sur., Blk. 3, sec. 14. S.D.O. 3,065 ft.

Val Verde County

J. F. Carter et al No. 1 Seller & Sons. sec. 34, Blk. A, I.&G.N. Sur. R.U.S.T.

Ward County

Cities Service No. 2 Brandenburg, sec. 4, Blk. 32, H.&T.C. Sur. Prep. run tubing 2,096 ft.
M. J. Delaney No. 1 J. E. Cooper, H.&T.C. Sur. Tstg. 2,092 ft.
J. E. Fitzpatrick et al No. 1 H. B. Carr sec. 125, Blk. 34, H.&T.C. Sur. S.D.R. 1,115 ft.
J. E. Fitzpatrick et al No. 1 F. K. Dyer, sec. 135, Blk. 34, H.&T.C. Sur. S.D.R. 2,500 ft.
Hoss & Downey No. 1 Meyers, sec. 17, Blk. 32, H.&T.C. Sur. Spd. and S.D.
Hoss & Downey No. 1 Ross Avery, sec. 36, Blk. 1, H.&T.C. Sur. Drlg. 1,875 ft.
A. E. Lynch No. 1-A Johnson, sec. 8 Blk. 32, H.&T.C. Sur. Drlg. 590 ft.
Mahree No. 1 Wilson, sec. 133, Blk. 34, H.&T.C. Sur. Fsg. 5,084 ft.
Patillo & Webster No. 1 Johnson. Tstg. 1,990 ft.
Sayre Oil Co. No. 1 Bertner, sec. 34, Blk. 1, H.&T.C. Sur. Drlg. 240 ft.
O. E. Schkode No. 1 Boogher, sec. 1, Blk. 32, H.&T.C. Sur. Drlg. 160 ft.
L. F. White et al No. 1 Rector-Monroe, E cor. sec. 3, Blk. 1, W.&N.W. Sur. S.D. 4,710 ft.

Winkler County

Ed. L. Gelder No. 1 R. D. Kessler & F. Kessler, sec. 14, Blk. B-3, P.S.L. Sur. Loc.

Yoakum County

Bahago & Bond Oil Corp. No. 1 J. L. West, sec. 607, Blk. D, J. H. Gibson Sur. S.D.O. 5,393 ft.
Gulf No. 1 J. C. Futch, sec. 796, Blk. D. J. H. Gibson Sur. Tstg. 5,140 ft.
Humble No. 1 Abilene State Bank, sec. 37, Blk. AX, P.S.L. Sur. Tstg. 5,005 ft.
Ohio No. 1 Claywater, sec. 638, Blk. D. J.H. Gibson Sur. R.U.R.
Shell No. 1-C Baumgart, sec. 866, Blk. D, J. H. Gibson Sur. Tstg. 5,018 ft.
Texas Co. No. 1 Walker, sec. 794, Blk. D El. 3,656 ft.: T.D. 5,180 ft.; P.B. 5,162 ft.; S.D. 5,162 ft.
Stogner & Pipkin No. 1 Blade, J. H. Gibson Sur. S.D.O. 5,307 ft.

RANGER (CENTRAL TEXAS) DISTRICT

Callahan County

Joe Gallagher No. 1 W. T. Harris, 200 ft. from S line, 1,050 ft. from E line sec. 347, G. W. Denton Sur. 2,000-ft. test, 5 mi. N Oplin.
J. H. Howell No. 1 E. I. Vestal, 1,149 ft. E line, 1,000 ft. N line, Jesse Dyson Sur., 2 mi. NE Cross Plains, rotary to 4,000 ft. Surf. to 100 ft.; S.D. at 600 ft.
J. C. Jackson et al No. 1 Thompson, 2 mi. S. Eula, sec. 30, B.B.B.&C. Sur. S.D. 1,955 ft.
Wittmer Oil & Gas Properties, Inc., No. 1 R. D. Williams et al, 300 ft. from N line, 467 ft. from W line sec. 2,269, T.E.&L. Sur., 2 mi. NE Putnam, 4,500-ft. test. Drlg. 1,040 ft.

Coleman County

J. F. Brock No. 1 J. H. Livingston, SE cor. SW¼ county, J. D. Waters Sur. No. 208. S.D. 1,070 ft.
S. M. Devine et al No. 1 Masterson, 2 mi. W of Burkett, Asa Wickson Sur. Drlg. 1,140 ft.
Garrett Oil Co. No. 1 W. S. Smith et al., 4 mi. SE Coleman, J. Thiele Sur. 2,300-ft. test.

Comanche County

N. D. Gallagher et al No. 1 Mrs. B. L. Terry, Desdemona pool, N. H. Kuykendall Sur. S.O. in Ellenburger; drlg. 4,815 ft.
Dobbs Oil Co. No. 1 Hodges, sec. 11, Blk. 2, H.&T.C. Sur.. T.D. 2,710 ft.; acid. 4,000 gal. 2,630-62 ft.; bldg. tanks.

Eastland County

G. D. Chastain et al No. 1 Weddington, 4 mi. N. Cisco, sec. 496, S.P.R.R. Sur. T.D. 4,079 ft.; plugging back.
Hayden, Reaves & Hose No. 1 P. L. Larkin, 3 mi. NW Rising Star, 912 ft. from W line, 546 ft. from S line, NW¼, sec. 40-2, E.T.R.R. Sur. Rig.
Neil A. Moore No. 7 Holcomb Heirs, 970 ft. from W line and 600 ft. from N line, SW¼ 1-4, H.&T.C. Sur. Loc.

Fisher County

Forest Dev. Corp. & Daube No. 1 L. G. Bennett, 660 ft. from N & E lines, sec. 51-3, H.&T.C. Sur. Rotary to 4,500 ft.; 3 mi. SW of Rotan.
Owens-Snebold & A. C. Varner No. 1 J. H. Milsap, 3,500-ft. wildcat, 2 mi. NW McCaulley, 330 SL 330 WL, sec. 61-2, H.&T.C. Sur. Drlg. 1,110 ft.
Tom C. Patton, Inc. No. 1 John B. Stribling, 660 ft. from S and E lines, sec. 110-3, H.&T.C. Sur. Pits; 4,500-ft. test.

Haskell County

Fain-McGaha Oil Corp. No. 1 T. G. Hendrick, C W½ sec. 104, Indianola Ry. Sur. Set 150 ft. of 12½-in.; drlg. 1,514
J. W. and A. E. McMillan No. 1 A. E. Pardue, 440 ft. from N and W lines, S½ M. Collum Sur. No. 4 A-685. Rotary to 3,500 ft.

Jones County

J. S. Bridwell No. 1 C. L. Carter, 220 ft. from N and E lines SW SE section 37-15, T.&P. Sur. S.S.O. 1,890 ft.; abd., T.D. 2,250 ft.
H. G. Daniels & Dale H. Dorn No. 1 F. T. Moore, 220 ft. from W line, 330 ft. from S line, Moore 115 ac. in John Winter Sur. 138. Drlg. 1,230 ft.
W. W. Fondren No. 1 Cox-Manley, 330 ft. from S line and 330 ft. W of C of S line of C. B. Sheppard Sur. 70. Drlg. 1,500 ft.
F. A. Gillespie & Sons No. 1 J. N. Hatfield, 3 mi. N Noodle Creek field, 330 from N and E lines, 80-ac. tr. in M. Northington Sur. No. 270. U.R. 6-in. to 2,770 ft., T.D.
Mack Hayes and Montour Oil Co. No. 1 Chittenden, 7 mi. SE Hamlin, Subd. 18 McMullen & McGloin Sur. 337. Drlg. 3,000 ft.
Humble No. 1 I. N. Irwin, 330 ft. from S and W lines sec. 48-18, T.&P. Sur., 1½ mi. E Noodle Creek pool. Rotary to 3,200 ft.; coring 2,343 ft.
Thos. D. Humphrey No. 2 N. D. Newton, 330 ft. from W line, 990 ft. from S line, Jas. Halfpenny Sur. 139. Drlg. 1,500 ft.
Iron Mountain No. 1 D. J. Herbst, 5 mi. E Hamlin, 330 ft. from N and E Sub. 18, Austin Williams Sur. 339. Set 10-in 2,245 ft.; drlg. 2,700 ft.
F. M. Loop No. 1 W. T. Young, 330 ft. from N line, 253 ft. from E. L. Young 276-ac., D. Bustillos Sur. 189. Loc.
F. W. Martin No. 1 B. N. Herndon, 330 ft. from S and W of NW sec. 1, M.E.&P. Sur. Collapsed 8-in. at 2,567 ft., T.D.
F. W. Merrick et al No. 1 C. A. Cox, cent. Cox 119-ac. tr., J. H. Hughes Sur. No. 201. Collapsed 8-in. at 1,700 ft., T.D.
B. H. Roth No. 1 D. A. Kinney, 4,000-ft. test, 330 ft. from S and E of NW sec. 7-4, H.&T.C. Sur. Drlg. 2,600 ft.
Stanton & Miller No. 1 Gaither, 4½ mi. N of Anson, sec. 38, B.B.B.&C. Sur. S.D. 2,180 ft.
Joe A. Worsham et al No. 1 J. H. Commons, 330 ft. from E line, S½ E 80-ac., Subdiv. 8, A. W. Hill Sur. No. 4. Loc.

Nolan County

Hantho-Nelson, Inc., No. 1 J. H. Withers, C SW¼ sec. 65-21, T.&P. Sur. Wildcat to drill 4,000 ft. Spd. to 200 ft. W.O. rotary.

Palo Pinto County

W. H. Clement No. 1 Federal Life Ins Co., 2 mi. W Mineral Wells, sec. 51. T.&P. Sur., Blk. A (E of B). Drlg. 1,710 ft.
Bill Cole et al No. 1 J. W. Harris Est., NW cor. county, De La Garza Sur. S.D. 950 ft.

Shackelford County

Danciger No. 2 J. E. McCown, 330 ft. from S and E sec. 158, B.B.B.&C. Sur., N of set to Haterius. Top Palo Pinto 3,187 ft.; cored 3,189 to 3,212 ft.; filled 1,500 ft. in oil; to acidize.
Joe DeGrazier No. 1 Harbough, E cen. part of county, sec. 1,563, T.E.&L. Sur. 4,500-ft. test; drlg. 2,000 ft.
Forest Dev. Corp. No. 1 T. G. Hendrick, NW cor. of county, 2,600 ft. from N line and 4,300 ft. from W line of sec. 1, A.B.&M. Sur. Est. 15,000,000 ft. gas per day 1,603-17 ft.; gas 1,662-65 ft., incr. est. 4,000,000 ft., 1,680-85 ft.; est. 1,000,000 ft. 1,804-06 ft. and 1,810-15 ft.; S.S. oil and wtr. 1,864 ft.; inc. wtr. 1,880-82 ft.; set 6-in. to 2,620 ft.; drlg. 2,700 ft.
Ungren & Frazier No. 1 J. S. McKeever, 306 ft. from W line, 354 ft. from N line, NW¼ SW ¼ sec. 14-3, H.&T.C. Sur. 3,500-ft. test; fsg. blr. 1,390 ft.

Stephens County

Danciger Oil Ref. Co. No. 1 Mrs. Aileen Copeland, 8 mi. SE Ivan, 1,196 ft. from E line and 350 ft. from S line of sec. 1, M.E.P.&P. Sur. Drlg. 3,542 ft.
Graham, Hafner, Lane & Inman No. 1 J. N. Yocum, 5 mi. SE of Frankell, 250 ft. from N and E lines of farm or approx. 2,525 ft. from E line and 1,400 ft. from S line of John R. Carter Sur Trt. 1,000 gal acid 3,575-90 ft.; est. 25-50 bbls. per day; drlg. 3,434 ft.
I. C. Little No. 1 R. M. Rogers, NE¼ of county, 150 ft. from E line and 1,980 ft. from S line of sec. 28, T.&P. Sur., Blk. 5. Tstg. after 10,000-gal. acid 3,960-4,055 ft., T.D.; with 3,000,000 ft. gas.
Lone Star Gas Co. No. 5 R. W. Brooks, 400 ft. E and S of C of sec. 54-7, T.&P. Sur. Ellenburger test 2½ mi. N of Van Parmer pool.
G. Willard Rich No. 1 J. W. Andrews, 330 ft. W line, 450 ft. S line, NW¼ sec. 39-7, T.&P. Sur. Drlg. 1,210 ft.

Stonewall County

Bert Fields No. 1 R. P. Pierson, C of E 80-ac., E. A. & S. M. Lee Sur. Abst. 817. Loc.
General Crude Oil Co. No. 1 J. D. Smith, SW cor. county, 330 ft. from S and E lines of sec. 371, H.&T.C. Sur., Blk. 2 Set 13⅜-in. 2,119 ft.; drlg. past 3,450 ft.
F. B. Parriott No. 1 H. T. Carlile, 330 ft. from S line, 990 ft. from E line, SW¼ NE¼ sec. 293, Blk. D, H.&T.C. Sur., rotary to 5,500 ft., 6 mi. NW of Swenson. Set 8¼-in. at 3,345 ft.; standardizing.

Taylor County

E. P. Campbell et al No. 1 McGee & Manley, 330 ft. from N, 750 ft. from E lines. SW¼ sec. 22-16, T.&P. Sur. Drlg. 2,250 ft.
Bert Fields et al No. 1 Sears, sec. 223, Blk. 64, H.&T.C. Sur. Drlg. 2,985 ft.
Wichita Prod. Co. No. 1 J. H. Parramore, 592 ft. from E line, 400 ft. from S line, SW¼ sec. 81-14, T.&P. Sur. Loc.

Throckmorton County

Humble O. & R. Co. No. 1-A Reynolds Cattle Co., 330 ft. from S and E lines, sec. 7-2, A.B.&M. Sur. H.F.W. 2,525-30 ft.; past 3,500 ft.; will drill to 4,500 ft.
Morris & Spoonts No. 1 Alden Bros., NW cor. county, 1,350 ft. from E line and 5,210 ft. from S line of Raymond Sanches Sur. A-248. Drlg. 810 ft.
White & Duncan No. 1 Reynolds Cattle Co., 330 ft. from S and W lines, NE¼ sec. 83, Comanche Indian Reservation. Pits.
Henry Zweifel No. 1 J. H. Lee, 4 mi. NE of Woodson, 930 ft. from E line and 2,011 ft. from S line of J. A. George Sur. T.D. 865 ft.; S.D.

Wise County

Latex Oil Co. No. 1 Smith, 3 mi. E of Bridgeport, Jas. Couch Sur. T.D. 4,075 ft.; P.B. to 3,910 ft.; S.D.; W.O.

E. C. TEXAS WILDCATS

Anderson County

Tide Water-Seaboard No. 2 J. Reagan. J. Adams Sur. Drlg. 2,961 ft.

Angelina County

J. C. Bonham No. 1 Cameron Lbr. Co., E. Miller Sur., 3 mi. SE of Zavalla. S.D. 1,630 ft.
J. C. Bonham No. 3 Cameron Lbr. Co., E. Miller Sur., 3 mi. SE of Zavalla. Drlg. 420 ft.
Ginter Co. No. 3 Copes Heirs, J. Morin Sur., 4 mi. E of Dibol. Completed, 10 B.O.P.D.
B. L. Hoffman No. 1 Jones, W. W. Hales Sur., 8 mi. SW of Huntington. Drk.
C. E. Parrott No. 1 J. C. Burres, W. Plucker Sur., 2½ mi. W of Huntington. Drk.

Cherokee County

J. G. Mayo et al No. 1 J. H. Bowlery, W. H. Walters Sur. Drlg. 2,900 ft.
Merica Oil Co. No. 1 New Birmington Dev. Co., Levi Jordan Sur., ¾ mi. S of Rusk. Drlg. 3,206 ft.
Merica Oil Co. No. 1 Cherokee Dev. Co., A. J. Acker Sur., 2 mi. E of Maydelle. Drlg. 5,022 ft.

Dallas County

Plaza Oil Co. No. 1 Davidson, Marchants Sur., 1 mi. NW of Seagoville. S.D. 2,152 ft.

Falls County

McCleod et al No. 1 F. Bolton, J. R. Cockrill Sur., 4 mi. NW Rosebud. Fsg. 4,708 ft.

Franklin County

White-McGee & Harper No. 1 Harper, W. N. Dawson Sur., on Franklin-Hopkins Co. line, 6 mi. SW of Hagansport. R.U.

Freestone County

C. E. Rossiter No. 1 J. P. Fulton in J. P. Fulton Sur., 2½ mi. E of Donie. S.D. 956 ft.

Gregg County

Humble O. & R. Co. & Gulf O. Corp. No. 1 E. Robertson, M. Mann Sur., 2¼ mi. SW of Longview Trinity test. El. 272 ft.; drlg. 9,280 ft.

Henderson County

Howard Pet. Co. No. 1 H. W. Barton, A. J. Allen Sur. Drlg. 3,820 ft.
S. B. Howard et al No. 1 T. C. Self, F. Brown Sur., 3 mi. SW of Athens. D.&A.; T.D. 5,001 ft.
Jones-Mallory No. 1 A. Mallory, T. S. Mitchell Sur., 6 mi. SW of Mabank. S.D. 107 ft.

Hill County

J. Willis No. 1 W. P. Ball, S. Marshall Sur., 3 mi. NW of Covington. M.I.M.

Houston County

Peyton Bros. No. 1 J. N. Daniels, J. M. Procella Sur., ½ mi. N of Procella. Drlg. 4,037 ft.

Lamar County

Cooper Bros. No. 2 L. B. Hayes, L. Roberts Sur. Temp. abd. 703 ft.

Leon County

Lone Star Gas No. 1 Sarah Melasky, 1 mi. S of Buffalo pool. Comp., 58,000,000 ft. gas.

Limestone County

C. L. Brown No. 27 N. B. Boyd, R. B. Longbotham Sur., 3 mi. S of Wortham. T.D. 1,402 ft.; oil sd.; P.B.; tstg.
J. S. Cosden, Jr. No. 1 J. J. Bower, J. Breeding Sur., near Prairie Hill. S.D. 602 ft.
Stanolind O. & G. Co. No. 1 T. Norris, in Thresher Sur., 5 mi. N of Kosse; 6,500-ft. test; elev. 528 ft.; tstg. 5,300 ft.

McLennan County

Chapman & Kahn No. 1 Carl Hartsman, B. C. Walters Sur., 1½ mi. S of McGregor. Drlg. 810 ft.
Kilgore No. 1 J. M. Marrs, J. S. Rutland Sur., 2 mi. S of Bosque. S.D. 1,200 ft.

Navarro County

G. W. Gibson No. 1 J. H. Edgar, M. Meazel Sur., 2½ mi. S of Richaland. Tstg. 383 ft.
Natural Pet. Co. No. 1 Karen Brown, W. T. Turner Sur., 2 mi. E of Roane. S.D. 1,735 ft.
Mrs. Jane Robinson No. 1 Fortson Bros., Eli Smith Sur., 5 mi. NE Corsicana. Drlg. 2,560 ft.
T. Sharpe et al No. 1 E. B. McDowell, T. Jordan Sur., 1½ mi. S of Bassets. S.D. 3,160 ft.

Smith County

H. L. Hunt et al No. 1 S. H. Bradly, T. P. Payne Sur., 10 mi. E of Tyler at Chappel Hill. Drlg. 4,460 ft.
Mayo-Housh & Thompson No. 1 J. B. Mayfield, Wm. Keys Sur., 4 mi. SE of Tyler. S.D.W.O. 4,943 ft.

Titus County

Lee Umbernhour No. 1 J. M. Sykes, J. Mathews Sur., 1 mi. N of Winnsboro. S.D. 1,865 ft.

Trinity County

Bilinoski et al No. 1 Trinity State Bnk., B. F. Wright Sur., 2 mi. S of Trinity. Drlg. 880 ft.

Upshur County

Tom Hunter and American Liberty No. 1 J. P. Carter, J. H. Fields Sur. S.D. Drlg. 7,945 ft.

NORTH TEXAS WILDCATS

Archer County

Hull & Silk No. 1 L. F. Wilson, sec. 25, A.T.N.C.L. Sur. 6⅝-in. 3,830 ft.; O.S. 3,841-58 ft.; flowed 244 bbls. 3 hrs., ¾-in. choke.
Kilgore-Luginbyhl & Johnson No. 1 Ford, T. M. Cecil Sur. A-982. 4,500-ft. test; drlg. 2,940 ft.
Wayne King et al No. 1 C. A. Arthur, sec. 3, G.H.&H. Sur. A-158. S.D. 210 ft.
Lewis Prod. Co. No. 1 W. C. Frey, sec. 17, P.P.S.L. Sur. 6⅝-in. 3,978 ft.; sdy. L. 3,973-82 ft.; test showed oil; drlg. 4,120 ft.

Baylor County

D. S. Kelly No. 1 W. T. Waggoner, sec. 54, T.&N.O. Sur. S.D.O. 1,200 ft.
Wilcox O. & G. Co. No. 1 W. H. Portwood, T.E.&L. Sur. Loc.; 6,000-ft. test.

Clay County

Barnett Pet. Co. No. 1 Ben Nutter, sec. 30, Grayson Co. Sch. Lds. S.D. 4,087 ft.
Deep Oil Dev. Co. No. 1 C. H. McClellan, Chas. F. Stanley Sur. A-407. Drlg. 4,289 ft.
Walter Gant No. 1 Bryant Edwards, S. C. Beldon Sur. A-12, 6,000-ft. test. Drlg. 3,472 ft.
Healdton O. & G. Co. No. 1 Wallace, Belcher Subd. Drlg. 4,960 ft.
W. P. Luse No. 1 Hapgood, sec. 68, Marion Co. Sch. Ld. 5,000-ft. test; drlg. 2,475 ft.

Oil Man's Calendar

April

4-6—Cincinnati, Ohio, A.G.A. Distribution Conference, Netherland Plaza.
5-6—Milwaukee, Wis. National Association of Petroleum Retailers, mid-year directors meeting.
11-12—Chicago, Ill. Oil Burner Institute, annual meeting, Palmer House.
12—Kilgore, Tex., East Texas Chapter, A.P.I. Division of Production, High School Auditorium.
13-15—Cleveland, Ohio, National Petroleum Association.
13-15—Houston, Tex., Petroleum Industry Electrical Association.
14-15—Milwaukee, Wis. Society of Automotive Engineers, National Tractor meeting, Schroeder Hotel.
14-15—Pittsburgh, Pa., Eastern District A.P.I. Division of Production, William Penn Hotel.
15—Charleston, W. Va., annual convention, West Virginia Petroleum Association, Daniel Boone Hotel.
17-21—Dallas, Tex., American Chemical Society.
19—Los Angeles, Spring meeting, Pacific Coast district, A.P.I. Division of Production, Biltmore Hotel.
19-21—Norman, Okla., Gas Measurement Short Course.
20-22—Buffalo, N. Y., American Institute Mining and Metallurgical Engineers, Open Hearth Conference.
25-27—Hot Springs, Ark., Western Petroleum Refiners Association, annual meeting.
29-30—Wichita, Kans., Interstate Oil Compact Commission.
29-30—Independent Petroleum Association of America—Executive Committee meeting.

May

5-6—Asbury Park, N. J. Fuel Oil Distributors Association of New Jersey, third annual convention, Hotel Berkeley Carteret.
9-12—New Orleans, La., Natural Gas Department, A.G.A.
11-13—Tulsa, Natural Gasoline Association, Hotel Tulsa.
12-14—Tulsa, National Oil Scouts Association of America.
14-21—Tulsa, International Petroleum Exposition.
23-25—Wichita, Kans., American Petroleum Institute, eighth midyear meeting.
27-28—State College, Pa., seventh annual conference, School of Mineral Industries, Pennsylvania Grade Crude Oil Association and Pennsylvania Natural Gas Men's Association.

June

4—Robinson, Ill., sixth annual Petroleum Conference of Illinois-Indiana.
6—Houston, Tex., Oil Workers International Union.
16-18—Pittsburgh, Pa., Pennsylvania Grade Crude Oil Association.
20-24—St. Louis, Mo., American Society of Mechanical Engineers.
12-17—White Sulphur Springs, W. Va. Society of Automotive Engineers, summer meeting, The Greenbrier.
15-18—Dallas, Tex. American Society of Mechanical Engineers, National Oil and Gas Power Meeting.

June-July

27-1—Atlantic City, N. J., annual meeting of American Society for Testing Materials.

August-September

31-3—Spokane, Wash., Pacific Coast meeting of American Institute of Electrical Engineers.

September

14-16—Santa Barbara, Calif., annual meeting Pacific Coast Gas Association, Biltmore Hotel.

October

——Tulsa, I.P.A.A., annual convention.
6-8—Knoxville, Tenn., fall meeting of industrial minerals division of American Institute of Mining and Metallurgical Engineers.
10-14—Chicago, National Safety Congress, Stevens Hotel.

Wood Pet. & Roy. Corp. No. 1 I. H. Kempner, Blk. 44, Bosque Co. Sch. Ld. Sur. A-10. Drlg. 1,989 ft.

Cooke County

Keil & Randall No. 1 Rogers, E. Barnes Sur. A-43. Cmtd. 43 ft. 10 in.; drlg. 1,570 ft.
H. L. Nutting et al No. 1 H. P. Ware, A.C.C. Bailey Sur. A-44. T.D. 2,230 ft.; tstd. water and rainbow 2,216-19 ft.; S.D.O.
Sinclair Prairie Oil Co. No. 1 J. M. Best, T. Toby Sur. A-1,054. R.U.R.
Sunset Oil Co. No. 1 J. T. Donald, S.P. R.R. Sur. A-971. 3,500-ft. test; drlg. 1,255 ft.

Denton County

W. C. Curry et al No. 1 G. F. Owens, N Rudder Sur. A-1,060. S.D. 1,710 ft.

Foard County

Texas Co. No. 16 Johnson, sec. 37, S.P. R.R. Sur. Drlg. 1,700 ft.

Jack County

G. M. Gillespie No. 1 A. M. Street, sec 3339, T.E.&L. Sur. U.R. 8¼-in. 2,215 ft.; drlg. 2,940 ft.
Taubert & McKee No. 1 R. H. Eatherley, G. C. Stanley Sur. A-1653. Loc.
Van Eman & Richards No. 1 Whitsell, Wm. McElroy Sur. A-599. Fsg. 3,235 ft.

Knox County

O. P. Dorsey No. 1 A. S. Haskins, sec. 210, B.B.B.&C. Sur. Loc.

Montague County

H. H. Powell No. 1 Arch Durham, W. J. Wagoner Sur. A-936. Drlg. 790 ft.
J. W. Sorrell et al No. 1 J. E. Walthall, Sam. H. Smith Sur. A-662. S.D.O. 2,720 ft.

Wichita County

Bolin & Whittington No. 1 Waggoner Bros., sec. 21, H.&T.C. Sur. Sdy. L. 3,840-62 ft.; 6⅝-in. 3,851 ft.; flowed & swabbed 40 bbls. per hr. and S.D. for R.R. com. test.
C. W. Boller No. 1 S. Y. Collins, Charles Roberts Sur. A-540. Drlg. 2,240 ft.
M. T. Flanagan No. 1 Texas L. & M. Co., J. McColl Sur. A-194. Cor. 4,070 ft.; sd. 4,050-61 ft.; trace oil.
J. S. Graham No. 1 E. M. Goetze, sec. 2, W.C.R.R. Sur. A-444. 4,090-ft. test; spudded and S.D.
F. W. Merrick, Inc., No. 1 W. T. Waggoner, sec. 35, H.&T.C. Sur., Blk. 6 Top Ellenburger 3,745 ft.; S.L. 3,733-3,802 ft.; 6⅝-in. 3,740 ft.; P.B. to 3,550 ft. to perf. pipe.
E. J. Stump No. 1 M. P. Bishop, L. Netherly Sur. A-240. S.D.O.; S.L. 3,885-3,997 ft.; prep. to shoot.
West & Medders No. 1 Williams, sec. 25, H.&G.N. Sur. A-155. Drlg. 4,004 ft.

Wilbarger County

Loyd H. Brown No. 1 W. T. Waggoner sec. 33, Blk. 6, H.&T.C. Sur. Drlg. 4,260 ft. shale.
N. Gilbert No. 1 McGill, sec. 3, Blk. 9, H.&T.C. Sur. Sand 3,762-3,791 ft.; trace oil; U.R. 6⅝-in. to set 3,755 ft.
Jack Kadane No. 1 W. T. Waggoner, sec. 20, H.&T.C. Sur., Blk. 5. Sd. 2,230-40 ft.; trace oil; drlg. 2,700 ft.
E. C. Lawson No. 1 Ruitsch, sec. 21, H. &T.C. Sur., Blk. 9. Drlg. 1,650 ft.
Phillips Pet. Co. No. 1 W. T. Waggoner "Barger," sec. 11, H.&T.C. Sur., Blk. 14. Drlg. 3,350 ft.

Young County

Anzac Oil Corp. No. 1 E. S. Graham, A. Hines Sur. A-135. T.D. 4,000 ft.; tstg. L. 3,960-98 ft.
Cosden Oil Co. No. 1 Price, Y.C.S.L. Sur. No. A-1,285. Spudding.
N. B. Crenshaw No. 1 J. C. Dwight, sec 1,444, T.E.&L. Sur. S.D. 400 ft.
Howard Pet. Co. No. 1 G. R. Stewart, sec. 84, C.S.L. Sur. Drlg. 4,722 ft.
Kadane-Griffith No. 1 Sanders, sec. 1989 T.E.&L. Sur. Drlg. 3,825 ft.
A. N. Munhall No. 1 Ed Johnson, A. McLennan Sur. A-185. Drlg. 1,620 ft.

Canadian Fields

(Continued from Page 218)

by short wave radio and airplane. The well, started by Vancouver interests some years ago, is being completed by a Calgary group headed by Robert Wilkinson, who has been managing director of the Columbia company since last June.

Saskatchewan Operations

In the Vera district, in western Saskatchewan, work has been resumed by Franco Oils on Vera Oilfields No. 2. The 6⅝-inch casing is being run, preparatory to deepening to completion. In addition to finishing this test, the Franco company will make a geological survey of the surrounding territory this spring.

Ontario Drilling

In the Tilbury field, Kent County, Ontario, Union Gas Co. No. 298, W half Lot 159, Talbot Road North, Raleigh Township, is below 1,005 feet. Union No. 299, Lot 157, South Talbot Road, is below 600 feet. High-Grade Oil & Gas Co. has a location farther east, in Lot 138, South Talbot Road.

In the Dover field, Kent County, Prairie Oil & Gas Co. No. 6 Orville Crow farm, Lot 6, Front Concession, Raleigh Township, is in the bottom of the shales around 2,700 feet and getting close to the Trenton limestone.

In Chatham Township, Kent County, Ogletree Syndicate No. 2, Lot 13, Concession 5, is below 4,700 feet.

East of the Dawn field in Lambton County, Union Gas Co. No. 93, Lot 22, Concession 2, Euphemia Township, is below 1,200 feet.

In Perth County, close to St. Mary's, Volcanic Gas & Oil Co. has made a new location in Lot 21, Concession 18, Blanshard Township. This is the fifth of a series of tests for oil and gas north and west of the Brownsville field in Oxford County.

Considerable leasing is being done in Goderich and Hullett Townships in Huron County, in the vicinity of W. L. Forrest No. 1 test on the Howard Trewartha farm north of Clinton. Several companies are taking up acreage, though only the Forrest interests have so far undertaken actual drilling.

California Fields

(Continued from Page 194)

feet. It is believed possible that a sand body is within striking distance and it is hoped that this is found for a test before mechanical trouble develops. All equipment on the well is holding up in good shape, indicating that the maximum depth of present equipment has not yet been reached.

In the Lost Hills field No. 2-23 Theta of the Texas Co. proved to be a gas well upon completion a few days ago at 1,684 feet. It was carried down to 1,825 feet and then plugged back to 1,684 feet and the hole finished with 39 feet of 4¾-inch liner including 17 feet of perforated came in flowing 1,325,000 feet of gas along with some mud and water. Argo Petroleum Corp. No. 1-A Farnsworth in section 11-26-20 was good for 83 bbls. of 14.3-gravity oil per day upon completion at 1,291 feet. Production is cutting 12 per cent water.

San Joaquin Basin

In the Fruitvale field Western Gulf Oil Co. completed No. 33-B Kern County Land in section 22-29-27 pumping 106 bbls. of 19.5-gravity oil cutting 11 per cent daily from 3,872 feet, plugged back from 3,968 feet. In the Midway-Sunset field, Standard Oil Co. completed No. 35-23-D in section 23-32-23 pumping 425 bbls. of 26.8-gravity oil per day from 3,500 feet after the hole had been carried down to 3,818 feet and then plugged back. Ring Oil Co. has completed another new well on its holdings in the Mount Poso field where considerable success has been experienced during the past year. Ring's new producer is No. 6 Bowles in section 29-26-28 which was finished pumping 220 bbls. of relatively clean 15.4-gravity oil per day from 1,785 feet. It was finished with 65 feet of 7-inch liner including 43 feet of 140-mesh landed on bottom.

Kansas Fields

(Continued from Page 202)

Barber & Leiker No. 1 Fidelity Life, SW NE section 15-24-16, Woodson County wildcat 5 miles southwest of Neosho Falls, was to drill ahead after setting 10-inch casing at 595 feet.

Rooks County

Plainstock Oil Co. No. 2 Westhusin, NE NE SE section 11-9-17w, Westhusin pool, Rooks County, was an abandoned rig.

Producers Oil Co. and L. C. Dean No. 1 Ham, SW SW NW section 25-7-19w, wildcat 8 miles southwest of Stockton, resumed drilling below 330 feet, where it was shut down after setting 12½-inch casing at 312 feet.

NORTH TEXAS COMPLETIONS

Archer County

P. C. Burns No. 1 C. Cowan, 1,080-1,100 feet, 10 bbls.

Cooke County

Bridwell Oil Co. No. 2 J. Flusche, 1,193-1,209 feet, 125 bbls. Mildred Oil Co. No. 1 Garrett, 3,620 feet, dry. Pace Petroleum Co. No. 2 R. E. Aldridge A, 1,519 feet, dry. A. D. Robinson No. 13 J. H. Otto A, 801-92 feet, 75 bbls. E. J. Ruwaldt No. 4 G. T. Andress and others, 1,272-1,365 feet, 10 bbls. Texas Co. No. 2 F. J. Trubenbach B, 909-20 feet, 45 bbls. Trumter Oil Co. No. 17 G. T. Andress, 757-88 feet, 120 bbls.

Clay County

Bridwell Oil Co. No. 4 T. C. Thornberry, 1,094-1,121 feet, 150 bbls. Franklin Drilling Co. No. 1 E. B. Staggs, 4,850 feet, dry. Republic Natural Gas Co. No. 81 F. B. Wyatt, 240-57 feet, 5 bbls.

Jack County

Auers & Overbey No. 1 Sadie M. Garrison, 2,830-3,200 feet, 12 bbls. Butler & Horn and others No. 1 C. C. Henderson, 3,504 feet, dry. R. C. Comption No. 1 C. C. Henderson, 700 feet, dry. Nelson Oil Syndicate No. 3 J. P. Eatherly, 2,828-3,007 feet, 4,500,000 feet gas. Van Eman & Richards No. 1 C. L. Whitsett, 3,384 feet, dry.

Montague County

Continental Oil Co. No. 3 H. C. McGaughey, dry, 1,611 feet; No. 2 J. W. Rowland, 1,040-60 feet, 23 bbls. Hynds & Holcombe No. 1 Mrs. A. B. Hinton, 746-97½ feet, 4 bbls. Lesh & McCall No. 1 S. E. Oneal, 2,537 feet, dry. Seitz Comegys No. 1 J. B. Roach B, 1,773-82 feet, 35 bbls. Sinclair Prairie Oil Co. No. 25 D. T. Holt, 1,758-83 feet, 30 bbls.; No. 26 D. T. Holt, 1,759-91 feet, 33 bbls.; No. 27 D. T. Holt, 1,801 feet, dry.

Wichita County

Barnes & Traugh No. 1 R. L. Kempner, 3,740-3,824 feet, 675 bbls. Bishop Oil Co. No. 1 J. L. and T. J. Waggoner B, 3,813-3,856 feet, 1,000 bbls. W. H. Bohner No. 3-A First National Co., 3,609-3,715 feet, 2,900 bbls.

Market Record of Active Oil Stocks

Compiled by Carl H. Pforzheimer & Co., 25 Broad Street, New York City, Member New York Stock Exchange and New York Curb Exchange

New York Stock Exchange

1938 High	1938 Low	Week ending Mar. 26 Sales	High	Low	Close	Stocks—	Total shares outsanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1937	1937 High	1937 Low	1936 High	1936 Low
72½	57	1,700	64½	58	59⅛	Amerada Corp.	788,675	N.P.	50cQ	3-31-38	$2.00	114⅞	51½	125½	75
24	19⅛	8,600	21½	19⅛	19⅛	Atlantic Refining	2,663,999	$25	25cQ	3-15-38	1.00	37	18	35⅛	26⅝
19	12¾	6,700	16	12¾	12¾	Barber Co.	387,149	$10	75c	12-16-37	1.00	43⅜	10⅛	38½	21
16⅜	11¼	17,900	13⅝	11¼	11⅝	Barnsdall Oil Co.	2,250,344	$5	25cQ	2-1-38	1.00	35¼	10	28¼	14⅛
10½	7½	51,800	8⅞	7½	7½	Consolidated Oil Corp.	13,919,417	N.P.	20cQ	5-14-38	.90	17⅞	7	17¼	11½
34⅜	21⅝	13,600	27½	21⅝	22½	Continental Oil of Delaware	4,682,615	$5	25cQ	3-31-38	1.50	49	24	44⅞	28⅛
8⅞	5½	22,500	7⅛	5½	5½	Houston Oil (new)	1,098,618	$25	....	10-17-30	....	17⅝	4¾	13⅞	6⅝
22⅝	13½	11,200	18	13½	13½	Mid-Continent Petroleum	1,855,912	$10	$1	11-1-37	1.50	35⅝	14	30⅞	17¼
17¾	11⅞	2,100	13½	11⅞	11⅞	Mission Corporation	1,399,345	N.P.	25c	12-24-37	1.25	34	15	29⅞	16¾
23	14¼	11,800	20⅜	15	15	National Supply	382,591	$25	$2 pf.‡	12-22-37	(‡)	41⅜	17⅝	75½	19⅞
14⅞	10	27,700	12⅝	10	10⅛	Ohio Oil Co.	6,563,377	N.P.	50cSA	12-15-37	1.00	22⅞	9	18	12⅛
15⅞	10¼	3,300	11¼	10¼	10¼	Pacific Western Oil	1,000,000	N.P.	75c	12-15-37	.75	29¾	11¾	23½	11⅝
9	8	No sales	..	..	..	Pan American Pet. & Trans.	4,702,945	$5	$1 •	12-21-37	1.00	17⅛	7	20⅝	12¼
42½	28¼	21,100	36½	28¼	29½	Phillips Petroleum	4,449,052	N.P.	50cQ	3-1-38	2.75	64	30⅛	52⅝	38⅛
20	15¾	6,200	18⅛	15¾	16½	Plymouth Oil Co.	1,050,000	$5	35cQ	9-30-37	1.65	29⅞	13	27¾	11⅞
13½	9	35,400	11½	9	9	Pure Oil Co.	3,281,120	N.P.	25c	12-1-37	.25	24⅝	8¾	27⅞	16
7⅞	5	22,100	6	5	5	Richfield Oil Corp.	3,986,638	N.P.	25c	12-24-37	.25	6½	4⅛	..	..
27½	16⅛	11,600	22	16⅛	16⅛	Seaboard Oil of Delaware	1,224,283	N.P.	25cQ	3-15-38	1.00	54⅛	16	44	30½
18¼	10	9,300	13½	10	10⅜	Shell Union Oil	13,070,625	N.P.	50c	12-20-37	1.00	34⅜	14⅞	28¼	14¾
34¾	21¼	3,900	26⅜	21¼	21½	Skelly Oil	1,006,348	$15	50c	12-15-37	1.50	60⅝	26½	47⅜	19½
16⅜	11⅝	45,200	14	11⅝	11⅝	Socony-Vacuum	31,151,071	$15	25c	3-15-38	.80	23¼	13	17½	12½
33⅞	26¾	17,900	30½	26¾	26⅞	Standard Oil of California	13,014,754	N.P.	35cQ†	3-15-38	2.00	50	27⅛	47⅝	35
35½	25½	13,900	29⅜	25½	25½	Standard Oil (Indiana)	15,196,241	$25	25cQ	3-15-38	2.30	50	26½	48½	32¾
35½	34	600	34½	34	34	Standard Oil of Kansas	112,837	$10	$5	12-20-37	5.00	43	30⅝	31	25
54⅛	42	31,200	48	42	42	Standard Oil of New Jersey	25,856,081	$25	$1.25SA†	12-15-37	2.50	76	42	70⅜	51⅛
57⅞	48½	700	50¼	49	49	Sun Oil	2,316,486	N.P.	25cQ	3-15-38	$1 & 8% Stk.	77½	44½	91	70
3⅜	1⅞	19,700	2⅜	1⅞	1⅞	Superior Oil Corp.	1,388,079	$1	....	....	....	7¾	1½	6¾	3
44⅞	34	33,500	40	34	34	Texas Corp.	10,896,858	$25	50cQ	4-1-38	2.25	65⅛	34¾	55¼	28⅞
4⅞	2¾	8,100	3½	2¾	2¾	Texas Gulf Producing Co.	888,134	N.P.	10c	12-23-37	.10	9⅝	2	8⅞	4⅜
10⅛	7¼	7,700	8¼	7¼	7¼	Texas Pacific Coal & Oil	888,237	$10	10c	3-1-38	.40	16⅝	5⅜	15¼	7½
15½	10½	9,400	13⅜	10½	10½	Tide Water Associated	6,288,512	N.P.	25cQ	3-1-38	1.20	21⅝	13⅛	21¾	14¾
21⅝	18	6,500	20½	18	18¼	Union Oil of California	4,666,270	$25	30cQ	2-10-38	1.40	28¼	17½	28½	20¾
23½	21	1,100	21½	21	21	Union Tank Car Co.	1,200,000	N.P.	40cQ	3-1-38	1.60	31½	22	31⅝	22⅝
2¾	2	2,600	2¼	2	2	Wilcox Oil & Gas	424,839	$5	....	5-10-28	....	6¼	1¾	5¼	2¾

•Payable in 3⅛% notes. †Includes extras. ‡One-tenth share $2 preferred stock.

New York Curb Exchange

1938 High	1938 Low	Week ending Mar. 26 Sales	High	Low	Close	Stocks—	Total shares outsanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1937	1937 High	1937 Low	1936 High	1936 Low
9⅜	5⅛	9,000	6½	5⅛	5⅛	American Republics Corp.	1,308,049	$10	30c	12-27-37	$0.40	10	6⅝	..	..
10¼	6⅛	1,200	8	6⅛	6⅛	Bridgeport Machine Co.	260,000	N.P.	1.25	12-30-37	$2.00	21⅜	7	21	13¼
39	35	No sales	..	..	..	Buckeye Pipe Line Co.	200,000	$50	75cQ	3-15-38	3.75	51½	36	50	39¾
110	100	50	107	107	107	Chesebrough Mfg. Co.	120,000	$25	$1.50Q†	3-21-38	7.00	123	95½	124¾	105
2	1	156,800	1⅝	1	1	Cities Service	37,804,394	N.P.	....	6-1-32	....	5⅜	1½	7⅜	3
2⅜	1	16,300	1⅝	1	1	Cosden Petroleum	399,687	$1	....	..	....	5½	1½	4½	1½
27½	19¼	5,100	23	19¼	19¾	Creole Petroleum	6,974,356	$5	50cSA†	12-15-37	1.00	38¾	20¼	39	19⅞
8⅜	6⅞	900	7½	6⅞	6⅞	Darby Petroleum	351,390	$5	25cSA	1-15-38	.50	18⅝	6½	18⅛	9
3½	2	1,600	2⅝	2	2	Derby Oil & Refining	263,162	N.P.	....	.....	....	8⅜	2¼	6¾	1⅞
31	26	No sales	..	..	..	Eureka Pipe Line	50,000	$50	$1Q	2-1-38	4.00	47½	24½	47½	38½
42⅞	35½	8,900	38	35½	35½	Gulf Oil Corp.	9,076,202	$25	25cQ	4-1-38	1.00	63½	33	59	36
70	59⅜	2,700	65½	59⅜	60¼	Humble Oil & Refining	8,923,935	N.P.	37½c	4-1-38	2.00	87	54⅞	80	57
19½	16¾	2,200	17⅝	16¾	16⅞	Imperial Oil of Canada	26,919,871	N.P.	62½cSA†‡	12-1-37	1.25	24¼	14½	24½	19¾
8¼	6⅝	500	7¼	7	7	Indiana Pipe Line	300,000	$10	30c	5-14-38	.80	15	5⅞	9¾	5½
31¼	25	4,400	29	25	25⅛	International Petroleum	14,247,088	N.P.	$1.25†‡	12-1-37	2.50	30½	23½	39⅝	32⅝
5	3¼	600	3½	3⅜	3⅜	Kirby Petroleum Co.	500,000	$1	10c	4-15-38	....	8¾	2⅜	5¾	2⅝
25⅛	16½	5,400	20⅜	16½	17	Lion Oil Refining	270,000	N.P.	50cQ†	12-24-37	1.50	34	12½	17¾	7⅜
9¼	6¾	2,800	7½	6¾	6¾	Lone Star Gas	5,382,723	N.P.	20c	4-20-38	.60	14¼	5¼	14¼	9⅞
9⅜	6⅞	7,700	7¾	6⅞	6⅞	Louisiana Land & Exp.	3,000,000	N.P.	20cQ†	12-15-37	.50	15¼	6¾	15⅜	9⅞
8⅜	7	900	7⅞	7⅛	7⅛	Midwest Oil Co.	998,444	$10	50c	12-15-37	1.00	14⅝	6¼	..	..
5¼	4⅝	1,700	5	4⅝	4¾	Mountain Producers	1,682,182	$10	30cSA	12-15-37	.60	7⅞	4⅛	8⅜	5
14⅝	12⅞	1,100	13½	12⅞	13	National Fuel Gas	3,810,183	N.P.	25cQ	1-15-38	1.00	19½	12	23	17⅜
9¼	7¾	900	9	8	8	National Transit	509,000	$12.50	55cSA	12-15-37	1.00	12½	7¼	15¾	9¼
2⅝	1½	800	1½	1½	1½	New Mexico and Arizona	1,000,000	$1	1c	12-1-36	....	5	1⅛	6⅝	1⅝
4½	4	100	4	4	4	New York Transit	100,000	$5	15c	4-15-38	1.00	5⅜	3⅞	6¼	4¼
6	5½	300	5½	5½	5½	Northern Pipe Line	120,000	$10	25cSA	12-1-37	1.00	12¾	5¾	9¾	4⅞
7⅜	5	37,100	6⅜	5	5	Pantepec Oil	1,608,700	N.P.	....	.....	....	9⅝	2⅜	10⅛	3¼
3½	2⅛	3,000	2½	2⅛	2⅛	Root Petroleum Co.	336,045	$1	25c	2-1-37	.25	13¾	2	19¼	4½
4	2¼	1,600	3	2¼	2½	Ryan Consolidated	296,931	N.P.	....	.....	..	6½	2¼	4¾	1⅞
5⅜	3⅜	300	3⅝	3⅜	3½	Southern Pipe Line	100,000	$10	15cSA	3-1-38	.45	7¼	3⅞	7⅞	3¼
39	34½	1,000	36½	34½	34½	South Penn Oil	1,000,000	$25	50cQ†	3-31-38	3.65	56	35	44	32½
22	19½	200	20¼	19½	19½	Southwest Penna. Pipe Lines	35,000	$50	50cQ	4-1-38	2.00	42	20	60	44
18	15½	1,800	17	15½	15½	Standard Oil of Kentucky	2,604,790	$10	25c	3-15-38	1.50	21⅛	14¾	23⅜	17⅛
7½	6½	200	7⅛	6⅞	6⅞	Standard Oil of Nebraska	188,403	$25	25c	3-29-37	.25	13¾	8	14⅝	11
22	18	1,500	19¼	18	18	Standard Oil of Ohio	753,740	$25	25c	3-15-38	1.50	45	16	40	21¾
3¼	2½	5,000	2¾	2½	2½	Sunray Oil	1,910,119	$1	10c	12-24-37	.25	4⅞	2	5	2⅝
4⅜	3¾	1,000	4	3¾	3¾	Texon Oil & Land	336,028	$2	15cQ	3-31-38	.45	7⅝	2	9¾	5⅜
7⅝	5	5,400	5⅞	5	5⅛	Transwestern Oil Co.	750,000	$10	....	.....	.	13⅞	4⅝	.	.
5¼	3	32,400	3¾	3	3	United Gas Corp.	7,818,959	$1	10c	9-15-37	....	13⅝	3	10¾	4

†Includes extras. ‡Payable in Canadian funds. §Of which $1 was in preferred stock.

PERSONAL

HAROLD L. CURTIS, metropolitan division manager of the Shell Union Oil Corporation, presided at a dinner and meeting of Shell dealers and employes in the Hotel New Yorker, New York, last week. Sales plans for the year were discussed. RALPH F. CAREY, division sales manager, and CHESTER L. CLUCK, city manager in New York, were speakers.

DR. RAY LYMAN WILBUR, secretary of the interior in the Hoover administration and now president of Stanford University at Palo Alto. Calif., has appointed L. P. ST. CLAIR, president of the Union Oil Company, and G. H. van SENDEN, vice president of the Shell Oil Company, in charge of manufacturing, members of the consulting staff of the Graduate School of Business.

L. A. CARLTON, independent operator and drilling contractor, Houston, Tex., has returned from a hunting trip in Mexico.

R. H. ALEXANDER has been transferred from Kermit, Tex., to Lovington, N. M., by the Magnolia Petroleum Company.

J. W. HERBERT, president of the Herbert Oil Company, Fort Worth, Tex., and family, have returned home after spending the winter in Palm Beach, Fla., and Bahamas.

W. C. COOLIDGE, division manager of the Atlantic Refining Company, Houston, Tex., has been kept away from his office the past week by illness. He is reported improving.

ROBERT BENARDEAU has resigned as mechanical engineer with Stanolind Oil & Gas Company in Tulsa and is manager of the Franco Dominion Development Corporation, a French organization having producing properties in the Oklahoma City field.

R. P. MOSCRIP has been named mechanical engineer for the Kansas division of the Shell Petroleum Corporation to succeed M. A. SHERWOOD, who recently was promoted to superintendency of the division. These men have their offices in McPherson, Kans.

J. PAUL GETTY, principal stockholder of the Pacific Western Oil Corporation, has returned to his New York headquarters after visiting points in the Mid-Continent. The Pacific Western Corporation and associated interests have a controlling stock interest in the Mission Corporation. The latter holding company owns a majority of the stock of the Skelly Oil Company and a minority interest in the Tide Water Associated Oil Company.

WILMER R. SCHUH, president of the National Association of Petroleum Retailers, has announced the organization will meet in Milwaukee, Wis., April 5-6. At a dinner on the opening night FRANK H. ELLIS, grand knight of the association's fun organization, Grand Knights of the Hose, will install Annex No. 1, of which WILLIAM HEISE is chief hose knight.

P. E. ALLEN, domestic sales manager of the Tide Water Associated Oil Company, San Francisco, Calif.; J. M. EVANS, lubricating oil sales; HAROLD DEAL, advertising; WALTER BRUNN, merchandising; A. M. ARLETT, sales education, and B. W. SEARS, advertising assistant, attended the annual conclave of the district representatives in Los Angeles.

T. KOMATSUBARA, of the Toyoshoko Oil Company, Ltd., Tokio, and S. MORIYA, chemical engineer of the Ogura Oil Company, Ltd., Tokio, who arrived early this year on the West Coast for a tour of this country, are now in New York. The two plan to visit Washington, D. C., Tulsa, and Houston, Tex., before returning.

M. E. BROCK, Gulf Oil Corporation, Houston, Tex., has been appointed chairman of the committee on disposal of production wastes by GEORGE A. HILL, JR., chairman of the American Petroleum Institute's general committee, division of production. D. V. STROOP, of the Institute's staff in New York, was appointed secretary. Members of the committee named by Mr. Hill are H. K. ARNOLD and E. M. FREEMAN. Houston, Tex.; D. B. DOW, Bartlesville, Okla.; FRITZ KARGE and J. SAMUELSON, Los Angeles, Calif.; R. S. KNAPPEN, GLENVER McCONNELL and W. F. TAYLOR, Tulsa; A. S. RITCHIE, Wichita, Kans.; JOHN A. RITTER, Dallas, Tex.; G. O. SUMAN, Oil Center, Calif.

Do You Remember?

From The Oil and Gas Journal Files

25 YEARS AGO

Ike Libby, reckoned among the top-notch jar makers in the eastern oil fields, joins the Bovaird Supply Company's blacksmithing force in Independence, Kans.

Standard Oil Company of Louisiana brings in a 7,500-barrel well in No. 86 Stiles in the Caddo, Louisiana, field.

"Bottled" natural gas, called gasol, is being marketed in Pennsylvania. It can be used as an illuminant and for welding abraising metals. It is put up in steel containers.

20 YEARS AGO

F. W. Bridges, 50, North Texas field correspondent for The Oil and Gas Journal and Oil City Derrick, dies in Wichita Falls, Tex.

M. Edward Fannin, of Independence, Kans., has been placed in charge of the Prairie Pipe Line Company's offices in Ardmore, Okla.

The 30,000 employes of the Standard Oil Company of New Jersey have been given another boost in salaries. Since 1915 the average wage advance of Standard of New Jersey employes has been 79 per cent.

10 YEARS AGO

H. C. Folger, chairman of the board of Standard Oil Company of New York, resigns as a director and officer. He started in the oil business in 1879.

Joseph Seep, in his ninetieth year, chairman of the board of directors of the South Penn Oil Company, died in Titusville, Pa. He was the last active survivor of the big figures.

M. G. Vilas retires as secretary and treasurer and director of the Standard Oil Company of Ohio, and is succeeded by George A. Burke as director; S. W. Hecker as secretary and Howard Jones as treasurer. Failing eye sight caused Mr. Vilas' retirement.

Homer M. Preston, widely known oil producer in eastern and Mid-Continent fields, dies at his country home in Chautauqua County, New York.

J. E. HESTON, former petroleum engineer with Cities Service Oil Company in Hobbs, N. M., has been transferred to the company's New York engineering department, detailed to special assignments.

MYRON M. KINLEY, Houston, Tex., internationally known through his work in extinguishing oil fires, was in Tulsa last week, helping to settle the estate of his brother, Floyd T. Kinley, who met accidental death recently at a wild well in Southwest Texas.

J. C. HUNTER, of Abiline, Tex., president of the West Central Texas Oil and Gas Association, spoke at the annual convention of the West Texas County Judges and Commissioners Association last week. "The oil industry is a business institution," he told his hearers; "not a get-rich-quick enterprise."

C. C. SPICER, president; H. H. MADDREN, vice president, and G. B. KNOX, secretary-treasurer, were re-elected at the annual meeting of the Republic Petroleum Company held in Los Angeles, Calif. In addition to the executive department the board of directors consists of DAVID R. FARIES, NORMAN CHANDLER, W. W. DIEHL, F. V. GORDON, R. E. HAVENSTRITE, J. W. PAUSON and CLAY ROBBINS.

E. H. ADLER, industrial engineer of the San Diego Consolidated Gas & Electric Company; NORBERT O. FRATT, commercial manager of the Seattle Gas Company, and H. W. EDMUND, commercial manager of the Coast Counties Gas & Electric Company in Santa Cruz, Calif., were chairmen of their respective divisions at special meetings of Pacific Coast gas companies held in conjunction with the Western Metal Congress in Los Angeles during the past week.

PARAGRAPHS

JOSEPH CHALMERS, engineer for the Batafche Petroleum Company, technical organization of the Royal Dutch-Shell group, visited California on his trip from The Hague, Holland. After a five-day stay at Taft and Bakersfield, where he was employed by the Shell Oil Company from 1923 to 1926, Mr. Chalmers left to return to Europe, accompanied by MRS. CHALMERS.

N. M. HUTCHINSON, of the Cities Service Oil Company, Bartlesville, Okla., has been elected chairman of the Mid-Continent district of the American Petroleum Institute's division of production for 1938-39. The new vice chairmen are C. H. KEPLINGER, Shell Petroleum Corporation, McPherson, Kans.; A. J. HOLLAND, Texas Company, Pampa, Tex., and T. J. HAMILTON, Phillips Petroleum Company, Oklahoma City, Okla. The secretary-treasurer is HENRY MILLER, Lario Oil & Gas Company, Wichita, Kans. VAN D. BENNETT, of the Sunray Oil Company, Tulsa, was made chairman of the advisory committee of which Mr. Hutchinson is an ex-officio member.

GEORGE B. McCAMEY, president of the Cordova-Union Oil Company, Fort Worth, Tex., has returned from a vacation at Hot Springs, Ark.

JOSEPH C. SMITH, of Smith Weihman Company, Inc., was reelected president of the Oil Trades Association of New York, at the annual meeting last week in the Hotel Waldorf Astoria. Mr. Smith had been secretary of the association 20 years. Others elected are: Vice president, W. C. CORREA; secretary, ALBERT J. SQUIER; treasurer, RUDOLF SONNEBORN. Directors chosen: CHARLES BACON, JOHN BAKER, C. V. BEATON, J. H. BLACKNEY, J. A. BRITTON, JR., D. E. HOFFMAN, W. M. OSBORN, KEN PATTERSON, JOHN RENICK, BERT EQUIER, Mr. Correa, Mr. Smith and Mr. Sonneborn.

JOHN FOWLSTON is moving from Scott City, Kans., back to his old home in Amarillo, Tex., where for several years he was in charge of the Northern Gas Company's Panhandle interests.

ALBERT WRIGHT, general superintendent of the Amiranian Oil Company, Ltd., has left New York for Iran. K. THEODORE TAGGERT, GEORGE J. BAKER, LESLIE BAKER RICHARDSON, SAMUEL ELLIS McDONALD and CHARLES P. MacDONALD, JR., preceded Mr. Wright to Iran, accompanying the first supplies for the drilling rig sent out by Amiranian to start active exploration of the concession in northern Iran. R. L. KUSS sailed from New York March 15 for Beirut. From that point will proceed to Iran to join the drilling crew.

C. P. DIMIT, vice president in charge of production for Phillips Petroleum Company, Bartlesville, Okla., who was in Los Angeles on business, left for his home office last Friday.

JAMES MICHELIN, former president of the Royalty Service Corporation, has reentered the California oil industry as owner of a drilling well in the Wilmington field.

JACK STEELE, chairman of the federal tender board in Kilgore, Tex., has announced that the board's offices will move to permanent and larger quarters formerly occupied by the hospital in Kilgore which was threatened by an oil well fire several weeks ago.

FRANTZ RAREY, petroleum engineer for the Carter Oil Company, working in the Fitts area of Oklahoma, has been assigned to a position on the engineering staff of the Tropical Oil Company, Standard Oil Company (New Jersey) subsidiary, and he will leave for El Centro, Colombia, South America.

M. S. MAYFIELD has been named chief division engineer for the Cities Service Oil Company in East Texas. He succeeds HUGH MAPLES, who has joined the staff of the American Petroleum Institute in Dallas, Tex. R. W. ELY has been assigned to the Cities Service engineering department in the East Texas field.

JOHN S. HESS, Sinclair Refining Company, New York, has been designated chairman of the American Petroleum Institute's 1938 committee on disposal of refinery wastes; K. G. MacKENZIE, the Texas Company, New York, chairman of the committee on testing methods and specifications, and J. BENNETT HILL, the Sun Oil Company, Marcus Hook, Pa., chairman of the program committee, division of refining.

No Swivel-Chair Start

When "Pew," "vice president," and "Sun" occur in the same sentence there is an impulse to vision a career which dodged the rough spots. Arthur E. Pew, Jr., vice president of the Sun Oil Company, in charge of manufacturing, engineering, and development, did no dodging. He has directed development of various processes used by his company, including the mercury vapor method of distillation, and he holds many patents on cracking, treating, and distillation procedure. But after being educated at Hill School, Pottstown, Pa.; United States Naval Academy, and Massachusetts Institute of Technology, graduating from the last-named institution in 1920, he did not slide into a swivel chair. He went to work for the Sun as a scout in South Texas and the Mexia field. Two years later he was transferred to the refinery at Marcus Hook, Pa., where he did shifts on the stills and in the maintenance department. Later they put him in the engineering department. There his practical experience, added to his school training, kept him moving forward, and in 1926 he was appointed chief engineer. The next year he was elected a director. In 1930 he was chosen to fill his present post.

ARTHUR E. PEW, JR.

Mr. Pew is active in the American Petroleum Institute, serving on the central committee on refinery technology and the automotive survey committee. He has been chairman of the committee on standardization of refinery equipment since January, 1933. He was born in Mercer, Pa.

H. D. CARTER has resigned as president and director of the Meraux Terminal Corporation, Meraux, La.

OSWALD F. GIDDINS of Ringgold, La., has sailed for Cairo, Egypt, where he has been stationed by the Texas Company for three years.

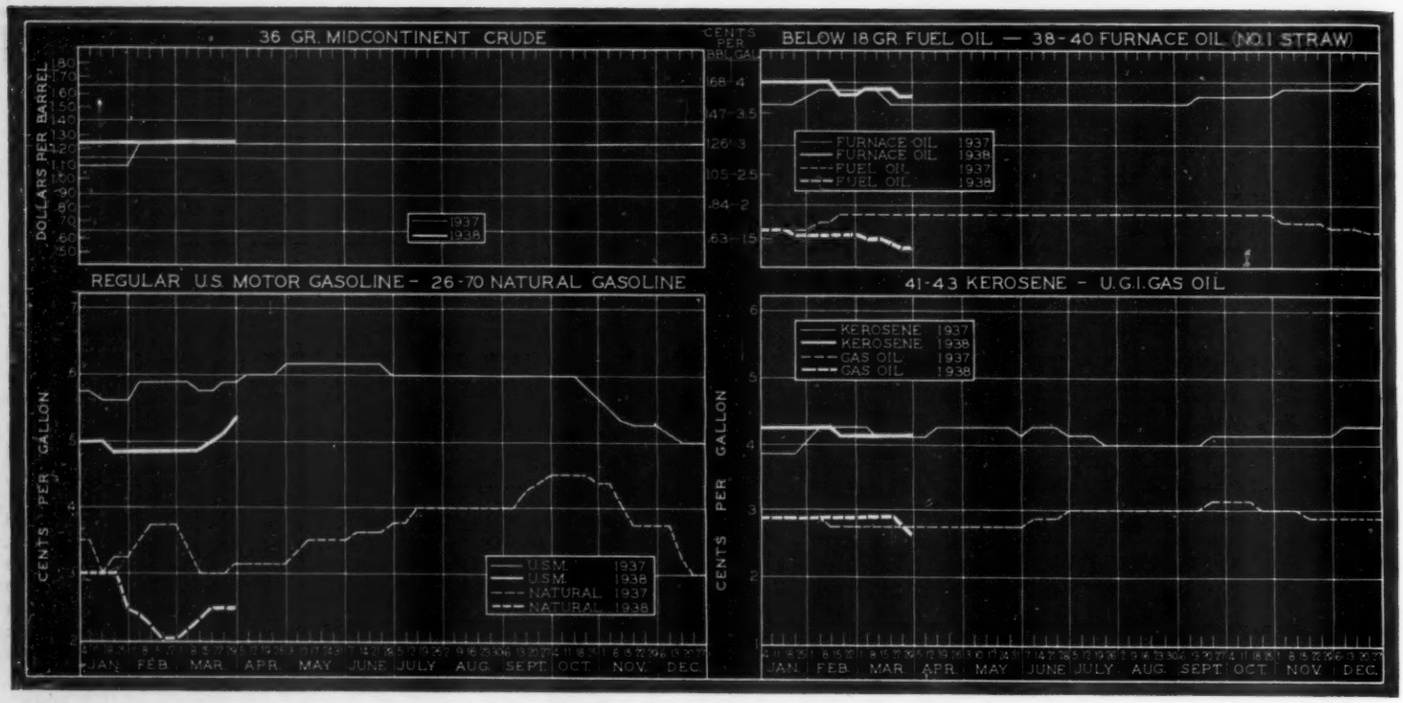
GUY STEVENS, of the Gulf Oil Corporation, New York producing division, is spending a vacation in Florida.

H. J. RUDDLE, formerly owner of H. J. Ruddle Company, of Los Angeles, Calif., and now associated with Eastman, Dillon & Company, has been elected a director of Pacific Western Oil Corporation, Los Angeles.

L. E. CLINGER, manager of development for the Oil Properties Company, of Los Angeles, spent last week in Bakersfield, Calif., making plans for an 11,000-foot test on a 5½-mile strip held by his company north of Elk Hills.

HAROLD VANCE, head of the petroleum engineering department of Texas A. & M. College, will assist MAYOR ROY H. LAIRD, of Kilgore, Tex., in making a survey of oil fire hazards in Kilgore. More stringent restrictions on drilling and storage will be considered.

H. C. McGEHEE, JR., was elected president of Texas Gulf Producing Company at the directors meeting in Houston, Tex., last Thursday. Other officers elected are HENRY M. BROWN, Houston, and W. J. NORTON, New York, vice presidents; DOYLE SMITH, Houston, secretary-treasurer. The stockholders previously had elected the directors, who included Mr. McGehee, Mr. Brown, Mr. Smith and JUDGE J. A. ELKINS and GURDON WATTLES.



Representative Mid-Continent Quotations on Crude Oil and Refined Products, Basis Oklahoma (Group 3)

Gasoline Inventories in Group 3 Area Are Drained by Flurry of Buying

By T. F. SMILEY

Refinery sales managers in the Group 3 area had a busy week which left the smaller independents with gasoline tanks drained close to the bottom. New freight rates, adding roughly 10 per cent to transportation costs, became effective Monday, March 28. The stream of orders, both spot and contract, which began two weeks ago, to take advantage of the old tariffs, had assumed flood proportions by last Saturday. Even on Sunday sales managers were reached by long-distance telephone at their homes with pleas for shipments that might still get under the wire. Most of these last-minute entreaties were futile, for stocks were exhausted and tankcars were scarce.

Independent Refiners Sold Up

The buying spree stopped with a jerk of course as soon as the higher freight rates were in actual operation; but this was expected, and it had little effect on market sentiment, which was increasingly hopeful. A further upward thrust of tankcar gasoline prices contributed to the good feeling that prevailed. Quotations rose on all octane classifications, but the top and bottom grades benefited most, picking up an extra eighth on the rise. Notwithstanding the fantastic heights to which total stocks have risen, there was pronounced scarcity of material among refiners in the Mid-Continent. Many were reported booked for weeks ahead.

Until gasoline supplies laid in before March 28 begin to run low there will be of necessity a rather quiet market in the Group 3 territory. Nevertheless, modest orders continued to come in this week. It was estimated that for a while the gasoline movement would be around one-third its normal volume. A commonly accepted opinion is that jobber stocks built up to save on freight cost will need replenishing before the output of Mid-Continent independent refiners will stand in need of quick outlets. Thus there has developed a stronger feeling that the higher prices established in the last week will hold until the effects of hurried buying have worn off.

There is growing confidence that the large companies which own the huge gasoline inventories overhanging the market will not dump them and that they will keep a watchful eye on their runs to stills. This belief, along with the strong position of the Mid-Continent market at the moment, is creating a feeling that the refinery industry will emerge safely from what admittedly has been—and still is—a critical situation.

Refined Oil Market Barometer

Encouragement is found in the tight condition of the gasoline market in Mid-Continent territory, and there is a growing feeling that if the major companies holding excessive stocks rigidly curtail their runs to stills a satisfactory season is in prospect. Tractor fuels are gaining a more important place than formerly in the market picture. Lubricant movement is disappointing.

MID-CONTINENT. Gasoline strong, prices up. Lubricants soft. Tractor fuel active.

EAST COAST. Gasoline gaining. Industrial fuel oil and lubricants slow.

GULF COAST. Gasoline slightly firmer. Kerosene, gas oil and fuels easy.

CALIFORNIA. Gas oil, diesels and fuel oils lack strength. Gasoline slightly steadier.

PENNSYLVANIA. Gasoline improving and quotations firmer. Lubricants weak.

CHICAGO. Gasoline demand satisfactory. Fuel oils soft. Heavy fuels dull.

Little Effect on Naturals

The flurry of buying touched off by the rise in freight rates affected natural gasoline to a limited degree only, for the reason that neither jobbers nor refiners care to lay in stocks of this volatile product unless they know it will be disposed of soon. It is easy for evaporation losses to wipe out savings made through buying at bargain prices. The moderate bulge in buying imparted a steadier tone to the naturals at their current price level, however. Manufacturers expressed no eagerness to sell at prevailing quotations anyway. They say they can just about break even, and there is no incentive to go after spot business so long as they have storage space in which to hold material until it will yield a little profit.

Although most of the heating oils avoided going lower, it was because of a sharp curtailment in output. Unwieldy stocks, which were causing concern a few weeks ago, seem to have been disposed of without unsettling the market. Tractor fuels were active, with prices firm. Kerosene, benefiting from use in this field, was steady. It was too early, refiners said, to appraise the effect of the many recent shutdowns of lubricant plants, but with spring plowing now well under way and the harvest season only a few weeks distant, they expressed optimism.

Spring Weather Stirs Demand for Gasoline on East Coast

By H. STANLEY NORMAN

NEW YORK, Mar. 29.—Expanding demand for motor fuel and lubricating oil resulting from almost mid-spring temperatures and weather conditions pointed markets for these petroleum products toward higher ground last week. The greater demand was reflected almost immediately in a stiffer market, although the general price range was practically unchanged. In western Pennsylvania, some refiners were reported holding U. S. Motor gasoline for an eighth of a cent above the preceding week's quotations, but in the eastern seaboard area the immediate effect was a halt to the drift into lower ground.

While the mild temperature materially improved gasoline movement, it had the natural counter-current influence on fuel oil. Standard Oil Co. of New Jersey lowered its tankcar quotations on No. 2 and No. 4 fuel oils a half cent per gallon early in the preceding week, and other large suppliers met the price. However, the new quotations were not necessarily of broad significance, since much of the spot selling had been at the reduced levels in the open market for at least two or three weeks. The reductions lowered No. 2 and No. 4 fuel oil to 4⅛ cents per gallon in tankcars, while the same products are offered at 4⅜ cents in barges. Standard made its change effective March 22.

A majority of refiners express themselves as entirely satisfied with the present activity in motor fuel, but the industrial fuel oil and lubricating oil traffic remains extremely light, averaging in most instances 15 to 20 per cent below a comparable period in 1937. Lack of activity in lubricating oil in western Pennsylvania is generally attributed to reduced operations in practically all industrial lines. The summer oil change-over campaigns are breaking early, and response from the motoring public is said in most quarters to be on a basis comparable to the preceding year. Inactivity of manufacturing industries naturally carries through commercial vehicle operation, displaying again the importance of this channel of consumption.

The tanker rates from the Gulf Coast to North Atlantic ports made new lows for the year last week, although currently more resistance to bearish pressure is evident in charter negotiations for clean tonnage. Fixtures were reported on the Gulf Coast last week at 17 to 18 cents per barrel for gasoline and as low as 15 cents per barrel for topped crude and light fuel oil. Extent to which the tanker market has influenced North Atlantic prices during the past two months can be determined by comparing rates of about 40 cents per barrel applying to both clean and dirty tonnage at the start of the year.

During the past two weeks the clean tonnage available on the Gulf Coast has diminished, and there is some evidence that coastwise movement of motor fuel will start an upward trend in the charter curve in the near future. The call for deliveries against contracts over the past year has been at an increased level. Introduction of higher freight rates applying to petroleum products on March 28 also prompted many inland distributors to draw heavily on their East Coast sources of supply over the past 10 days, although service from this area to the north and for a considerable inland area is served via the Hudson River and New York Barge Canal, both of which are now open for shipping.

Gulf Coast refiners say they are still unable to detect any material gain in their normal export business because of diversion of demand from Mexico to this country. However, most of the business which may accrue to the Gulf Coast due to the elimination of Mexico would not appear in the spot market. Probability that at least a part of the foreign requirements of international companies expelled from Mexico will be drawn in the immediate future from the Gulf Coast offers the possibility that stocks may be brought down to a more satisfactory level earlier than was expected this summer. Inquiries for high-octane motor fuel continued to drift into the Gulf Coast market from French and other European buyers, but instances of actual buying were absent. An unconfirmed report was current that a cargo of high-octane gasoline was sold during the preceding week at 5¼ cents, down an eighth from the quotations on similar material most frequently quoted. Suppliers of European government requirements on contract reported business in that direction was on a satisfactory basis. No further sales were reported this week from the Rumanian market, but the indifference of buyers was thought to reflect the sale during the preceding week at Constantza of a cargo of 64-66, 375-endpoint motor fuel at slightly below 4¾ cents, Gulf Coast basis.

In the New York area, where motor fuel can be delivered in most directions by water, the regular grade continued unchanged at 6½ to 6¾ cents per gallon. The slight improvement in tone of the market, however, had just about eliminated talk of 6¼ cents for this material. The upswing of prices in western Pennsylvania was due largely to anticipation of the higher freight rates which will have a greater bearing on general business. At the present level of 4⅞ to 5 cents per gallon for U. S. Motor gasoline, Pennsylvania prices are up three-eighths of a cent from their winter low of January. Fuel oil and kerosene followed seasonal trends in the Pennsylvania district at 5⅛ to 5¼ cents most frequently quoted on the latter product and about 4⅜ cents applying to 36-40 fuel oil. Export and inter-refinery trading in lubricating oil had practically dried up, but business with jobber contract customers was on a slightly higher level, doubtless a reflection of the season when cars are conditioned for more active summer service.

A cut of 10 cents per barrel was posted for diesel fuel oil at Philadelphia last week by Gulf Oil Corp. and Standard Oil Co. (New Jersey), making the current quotation there $1.85, or the same as quoted several days earlier in New York.

Bunker C fuel oil was reported in only fair demand, but the preced-

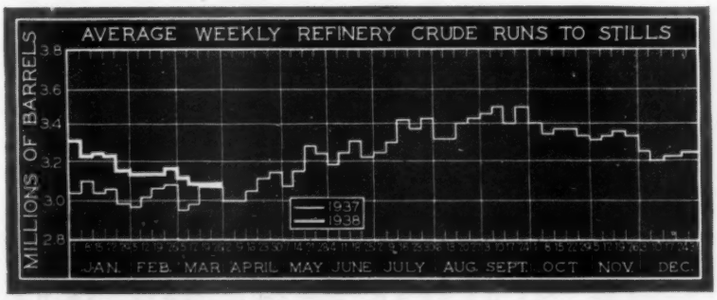
(Continued on Page 232)

A. P. I. Weekly Refinery Statistics

Week Ending March 26, 1938

	Capacity reporting (per cent)	Daily crude runs (bbls.)	Total gasoline stocks	Gas oil and fuel oil stocks
East Coast	100.0	474,000	22,898,000	9,277,000
Appalachian	88.4	95,000	3,575,000	1,261,000
Indiana, Illinois, and Kentucky	92.4	397,000	15,552,000	7,020,000
Oklahoma, Kansas, and Missouri	84.7	272,000	8,122,000	3,442,000
Inland Texas	56.6	136,000	2,561,000	1,495,000
Texas Gulf	95.7	721,000	13,641,000	8,590,000
Louisiana Gulf	96.6	133,000	2,429,000	3,063,000
North Louisiana and Arkansas	63.7	48,000	496,000	523,000
Rocky Mountains	69.7	40,000	2,305,000	704,000
California	90.9	483,000	16,319,000	85,094,000
Total reported	89.0	2,799,000	87,898,000	120,469,000
Estimated unreported	.....	281,000	4,960,000	2,500,000
*Estimated total	.....	3,080,000	92,858,000	122,969,000
*Estimated total, previous week	.....	3,080,000	93,192,000	122,067,000
*March 27, 1937	.....	3,060,000	83,538,000	96,591,000

*Bureau of Mines, currently estimated.



Stocks of Crude Oil in the United States

(BUREAU OF MINES ESTIMATES)

Week ending March 19, 1938	306,380,000 barrels
Week ending March 12, 1938	305,566,000 barrels
Week ending March 20, 1937	294,826,000 barrels

Retail Oil Markets

Tank-wagon and filling station prices on gasoline and kerosene furnished by the larger marketing firms

Prices as of March 29, 1938

Taxes

The gasoline quotations given in the following tables include the 1-cent federal tax, as well as state, county and city taxes. The gasoline is the regular or standard grade. In most areas a third grade and a premium grade are also available.

Standard Oil Co. (Indiana)

	Gasoline Tank wag.	Gasoline Dlr.	Gasoline Inc. tax	Kero. tank-wag.
Chicago, Ill.	15.3	13.3	4.0	10.2
Decatur	15.3	13.8	4.0	10.2
Joliet	15.3	13.8	4.0	10.2
Peoria	15.3	13.8	4.0	10.2
Quincy	15.1	13.6	4.0	10.0
Davenport, Ia.	15.3	13.8	4.0	‡10.2
Des Moines	15.1	13.6	4.0	‡8.0
Mason City	15.4	13.9	4.0	‡10.3
Sioux City	15.3	13.8	4.0	‡10.2
Duluth, Minn.	17.0	15.5	5.0	10.9
Mankato	16.7	15.2	5.0	10.6
Minneapolis	16.7	15.2	5.0	10.6
Lacrosse, Wis.	16.7	15.2	5.0	10.6
Green Bay	17.0	15.5	5.0	9.9
Milwaukee	16.5	15.0	5.0	10.4
Detroit, Mich.	15.1	13.6	4.0	9.8
Grand Rapids	16.3	13.1	4.0	11.0
Saginaw	16.1	14.6	4.0	9.1
Evansville, Ind.	16.8	15.3	5.0	†10.7
Indianapolis	16.9	15.4	5.0	†10.8
South Bend	17.2	15.7	5.0	9.0
Fargo, N. Dak.	16.7	15.2	4.0	11.6
Minot	17.9	16.4	4.0	12.8
Huron, S. Dak.	17.1	15.6	5.0	11.0
Kans. City, Mo.*	14.6	13.1	4.0	9.5
St. Louis*	14.9	13.4	4.0	9.8
St. Joseph	14.6	13.1	4.0	9.5
Wichita, Kans*.	14.1	12.6	4.0	7.0

*State tax 2 cents, 1-cent city tax and 1-cent federal tax. †Does not include 4-cent state tax. ‡Does not include 3-cent state tax.

Exclusive of state general sales taxes.

Discounts to commercial consumers: On purchases per month off tank-wag-on prices: 1,000 gallons or more, 1.5 cents off; minimum delivery 25 gallons.

Stanolex Fuel Oil in Chicago

Effective Dec. 7, 1936, f.o.b. Chicago tank-wagon prices: Range oil, 1-99 gallons, 8.8 cents; 100-149 gallons, 7.8 cents; 150 gallons and over, 7.3 cents. Stanolex No. 1, 1-99 gallons, 8.8 cents; 100-149 gallons, 7.8 cents; 150 gallons and over, 7 cents. Stanolex furnace oil, 1-149 gallons, 7.8 cents; 150 gallons and over 7 cents; Stanolex A, 1-399 gallons, 5.75 cents; 400 gallons and over, 4.75 cents. Stanolex B, 1-799 gallons, 5.75 cents; 800 gallons and over, 4.75 cents.

Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

	Gasoline Tank-wag. dlr.	Gasoline Tank-car con'r.	Gasoline Inc. tax	Kero. tank-wag.
Atl'tic, City, N. J.	12.75	11.25	4.0	8.5
Newark	12.75	11.25	4.0	8.5
Annapolis, Md.	14.85	13.35	5.0	9.5
Baltimore	14.25	12.75	5.0	9.0
Cumberland	16.65	14.15	5.0	10.0
Wash'g'n, D. C.	12.5	11.0	3.0	9.5
Danville, Va.	16.95	14.45	6.0	12.9
Norfolk	15.75	13.25	6.0	11.5
Petersburg	16.05	13.55	6.0	11.7
Richmond	16.05	13.55	6.0	11.7
Roanoke	17.25	14.75	6.0	12.9
Charles'n, W. V.	17.05	14.55	6.0	12.6
Parkersburg	15.35	13.85	6.0	11.2
Wheeling	16.25	14.85	6.0	12.2
Charlotte, N. C.	18.65	16.15	7.0	12.6
Hickory	19.15	16.65	7.0	13.0
Mt. Airy	18.95	16.45	7.0	12.8
Raleigh	18.25	15.75	7.0	12.1
Salisbury	18.75	16.25	7.0	12.7
Charleston, S. C.	17.25	14.75	7.0	11.1
Columbia	18.25	15.75	7.0	12.1
Spartanburg	18.95	16.45	7.0	12.9

Price basis to commercial consumers, effective March 8, 1937, in Maryland, District of Columbia, and in Arlington and Fairfax counties in Virginia; and March 12 in New Jersey: To contract accounts purchasing at least one full compartment at time by hose connection, on yearly purchases: From 2,500 to 100,000 gallons, consumer tank-wagon price at time and place of delivery; 100,000 gallons per year, consumer tankcar price plus .5 cent per gallon. Consumer tank-wagon price generally will be equivalent to dealer tank-wagon price less .5 cent per gallon.

Effective May 15, 1937, in North and South Carolina, West Virginia and Virginia (except Arlington and Fairfax counties): Commercial consumers taking deliveries of 50 gallons (W. Va., 100 gallons) or more at one time will be billed at posted consumer tank-wagon price. Accounts taking deliveries of less than 50 gallons (W. Va., 100 gallons) will be billed at 4 cents per gallon over posted consumer tank-wagon price. Generally the posted consumer tank-wagon price will be the equivalent to the dealer price less .5 cent per gallon.

Discount for kerosene, 1 cent off tank-wagon price for 25 gallons or more under contract (contract not necessary in Baltimore) except no discount in New Jersey.

Southern District

STANDARD OIL CO. OF KENTUCKY

	Gasoline Tank-wag.	Gasoline Net dlr.	Gasoline Inc. tax	Kero. tank-wag.
Atlanta, Ga.	21.0	18.0	7.0*	†14.0
Augusta	21.0	18.0	7.0	*14.0
Macon	21.0	18.0	7.0	*14.0
Savannah	19.5	16.5	7.0	*12.0
Birm'ham, Ala.	21.0	18.0	8.0	12.0
Mobile	21.0	18.0	9.0	†11.0
Montgomery	22.0	19.0	9.0	†13.0
Jackson, Miss.	19.5	16.5	7.0	*13.0
Vicksburg	19.5	16.5	7.0	*13.0
Jacks'ville, Fla.	22.5	17.5	8.0	†11.0
Miami	20.5	17.5	8.0	†12.5
Pensacola	22.0	19.0	9.0	12.0
Tampa	20.5	17.5	8.0	10.5
Lexington, Ky.	19.1	16.0	6.0	11.0
Covington	18.5	15.5	6.0	11.0
Louisville	19.0	16.0	6.0	10.5
Paducah	17.0	14.0	6.0	10.0

Price basis to tank-wagon consumers: Effective January 4, 1937, 3 cents per gallon below tank-wagon price. Kerosene prices in all states subject to 2 cents discount except in Kentucky where prices are net.

*Includes 1-cent state tax. †Subject to 2-cent discount.

Montgomery, Ala., has a county tax of 1 cent per gallon, and a city tax of 1 cent per gallon on gasoline, in addition to state tax; and 1 cent per gallon on kerosene. Mobile, Ala., has a city gasoline tax of 2 cents per gallon; Birmingham, Ala., has a city gasoline tax of 1 cent per gallon; Pensacola has a city gasoline tax of 1 cent.

Rocky Mountain District

CONTINENTAL OIL CO.

	Gasoline Dealer	Gasoline Inc. tax	Kero. tank-wag.
Denver, Colo.	14.0	5.0	11.5
Grand Junction	19.0	5.0	15.0
Pueblo	13.0	5.0	10.5
Casper, Wyo.	17.0	5.0	11.5
Cheyenne	16.0	5.0	13.0
Butte, Mont.	19.5	6.0	15.5
Billings	19.5	6.0	15.5
Helena	19.5	6.0	15.5
Great Falls	19.5	6.0	15.5
Salt Lake City, Utah	19.5	5.0	16.0
Twin Falls, Ida.	21.0	6.0	18.0
Boise	21.5	6.0	18.0
Albuquerque, N. M.	17.5	*6.5	12.0

*Includes city tax of one-half cent.

Ohio

STANDARD OIL CO. OF OHIO

	Gasoline Tank-wag.	Gasoline Di-vided con'r.	Gasoline Inc. dlr. tax	Kero. tank-wag.
Ohio points	16.0	15.00	5.0	*13.0

*Includes state tax of 1 cent.

New York and New England

SOCONY-VACUUM OIL CO., INC.

	Gasoline Tank-wag. dlr.	Gasoline Tank-car con'r.	Gasoline Inc. tax	Kero. tank-wag.
Albany, N. Y.	14.5	12.5	5.0	9.0
*Met. N. Y.:				
M'nh't'n, Br'nx	14.5	12.5	5.0	8.75
Staten Island	14.5	12.5	5.0	8.75
Q'ns. & Brklyn	14.5	12.5	5.0	8.75
Buffalo	14.5	13.54	5.0	7.5
Rochester	15.0	13.17	5.0	8.5
Syracuse	14.5	13.12	5.0	9.0
Boston, Mass.	13.0	11.5	4.0	8.5
Portland, Me.	14.5	12.7	5.0	8.75
Manch'ter, N.H.	15.0	13.0	5.0	9.0
Burlington, Vt.	14.9	12.9	5.0	9.5

*Does not include 2 per cent city sales tax which is calculated on basis of net retail price exclusive of state and federal taxes.

Price basis to undivided dealer: Posted dealer tank-wagon price less .5 cent. Price basis to commercial consumer. Effective Nov. 15, 1936, monthly purchases of 25,000 gallons and over, consumer tankcar prices at delivery point plus .5 cent per gallon; monthly purchases of 5,000 to 25,000 gallons, undivided dealer price at delivery point; monthly purchases under 5,000 gallons, pay divided dealer tank-wagon prices at delivery point.

Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA

	Gasoline Tank-wag.	Gasoline Serv. sta.	Gasoline Inc. tax	Kero. tank-wag.
San Francisco	17.5	18.5	4.0	11.5
Los Angeles	17.0	18.0	4.0	10.0
Fresno, Calif.	18.5	19.5	4.0	12.5
Phoenix, Ariz.	21.0	22.0	6.0	*17.0
Reno, Nev.	20.0	21.0	5.0	13.0
Portland, Ore.	20.0	21.0	6.0	13.5
Seattle, Wash.	20.0	21.0	6.0	13.5
Spokane	22.5	23.5	6.0	16.0
Tacoma	20.0	21.0	6.0	13.5

*Includes 5-cent state tax.

Discounts to dealers: On gasoline, off tank-wagon price, to 100 per cent dealers, 3 cents; to split dealers, 2 cents. To commercial consumers: on tank-wagon price: on single deliveries of 40 gallons and over, advance quantity discount extended at time of delivery, 3 cents. Service station schedule applies on single deliveries less than 40 gallons. On kerosene in tankcar, transport truck and trailer delivery, 3 cents off tank-wagon price; plant deliveries to jobbers, 2.5 cents below tank-wagon.

Nebraska

STANDARD OIL CO. OF NEBRASKA

	Gasoline Tank wag.	Gasoline Dri.	Gasoline Inc. tax	Kero. tank-wag.
Omaha	17.7	16.2	6.0	10.5
McCook	17.5	15.0	6.0	10.0
Norfolk	18.1	16.6	6.0	10.0
North Platte	18.5	17.0	6.0	10.9
Scotts Bluff	19.2	16.0	6.0	12.0

Discounts to commercial consumers for tank-wagon deliveries covered only by standard commercial consumers contract, effective Jan. 1, 1935.

Central South District

STANDARD OIL CO. OF LOUISIANA

	Gasoline Tank-wag. dlr.	Gasoline Tank-car con'r.	Gasoline Inc. tax	Kero. tank-wag.
N. Orleans, La.	19.0	16.5	*10.0	†12.0
Baton Rouge	17.0	14.5	8.0	12.0
Alexandria	17.5	15.0	8.0	10.5
Lafayette	18.0	15.5	8.0	12.5
Lake Charles	18.0	15.5	8.0	12.5
Shreveport	16.5	14.0	8.0	9.5
Kn'ville, Tenn.	20.0	17.5	8.0	14.0
Memphis	18.0	15.5	8.0	12.0
Chattanooga	19.5	17.0	8.0	13.5
Nashville	19.0	16.5	8.0	10.5
Bristol	19.0	17.75	8.0	14.5

*Includes 2-cent parish tax. †Includes 1-cent parish tax and 1-cent state tax.

Price basis to commercial consumers: Effective May 15, 1937, deliveries of 50 gallons or more in one delivery takes posted consumer tank-wagon price. Accounts taking deliveries of less than 50 gallons at one time pay posted consumer tank-wagon price plus 4 cents per gallon. Generally, the posted consumer tank-wagon price will be equivalent to the dealer price less .5 cent per gallon.

Louisiana kerosene prices include 1-cent state tax.

Pennsylvania, Delaware and Part of New England

ATLANTIC REFINING CO.

	Gasoline Tank-wag. dlr.	Gasoline Tank-car con'r.	Gasoline Inc. tax	Kero. tank-wag.
Philadelphia, Pa.	13.75	12.25	5.0	10.5
Pittsburgh	15.0	13.0	5.0	11.0
Allentown	14.25	12.75	5.0	11.0
Erie	14.5	13.0	5.0	10.0
Scranton	14.5	13.0	5.0	11.0
Altoona	15.0	13.0	5.0	11.0
Dover, Del.	14.0	....	5.0	11.0
Wilmington	14.0	....	5.0	11.0
Springf'd, Mass.	13.5	....	4.0	8.5
Worcester	14.3	....	4.0	9.0
Hartford, Conn.	13.6	....	4.0	8.0
New Haven	13.5	....	4.0	8.0
Providence, R. I.	13.3	....	4.0	8.5

Price basis to undivided dealers, dealer tank-wagon price less .5 cent per gallon. Price basis to commercial consumers in Pennsylvania and Delaware, effective March 11, 1937: Consumers under contract using 100,000 gallons or more per year full compartment hose deliveries, tankcar plus .5 cent. Consumers under contract using less than 100,000 gallons per year compartment hose deliveries, undivided dealer price. Consumers under contract less than full compartment delivery, consumers not under contract less than full compartment delivery, and consumers not under contract full compartment delivery, divided dealer price. Less than 25 gallons, tank-wagon delivery, 4 cents per gallon above undivided dealer price.

Oklahoma and Arkansas

CONTINENTAL OIL CO.

	Gasoline Dealer	Gasoline Inc. tax	Kero. tank-wag.
Muskogee, Okla.	14.5	5.0	7.0
Oklahoma City	14.0	5.0	8.0
Tulsa	14.0	5.0	6.0
Ft. Smith, Ark.	14.25	5.0	8.0
Little Rock	17.25	7.5	9.5
Texarkana	14.0	5.0	8.5

Texas

	Gasoline Tank-wag.	Gasoline Serv. sta.	Gasoline Inc. tax	Kero. tank-wag.
Dallas, Tex.	14.0	18.0	5.0	8.0
Fort Worth	14.0	18.0	5.0	8.0
Houston	14.5	19.0	5.0	8.0
San Antonio	13.5	17.5	5.0	8.0

Naphtha

STANDARD OIL CO. (INDIANA)

	Tank-wagon*
Oleum spirits	15.7
V.M.&P. naphtha	16.0
Cleaners' naphtha	15.0
Stanisol	15.0

*Prices include 3-cent Illinois tax, but not 1-cent federal tax or 2 per cent retail occupational tax.

Prices f.o.b. Chicago. Each price subject to discount of 1 cent per gallon for 150-gallon lots if covered by contract.

Canada*

3 Star Imperial Gasoline
IMPERIAL OIL, LTD.

	Tank-wag.	Inc. tax	Kero. tank-wag
Halifax, N. S.	24.5	10.0	18.5
St. John, N. B.	24.5	10.0	18.5
Montreal, Que.	21.0	6.0	17.0
Toronto, Ont.	22.0	6.0	17.0
Hamilton, Ont.	22.0	6.0	17.0
Winnipeg, Man.	27.5	7.0	20.7
Brandon, Man.	28.1	7.0	22.3
Regina, Sask.	27.0	7.0	22.0
Saskatoon, Sask.	29.8	7.0	24.9
Edmonton, Alta.	26.5	7.0	21.5
Calgary, Alta.	24.0	7.0	19.0
Vancouver, B. C.	23.0	7.0	23.0

*Imperial gallon used in Canada.

Divided dealers pay tank-wagon price. Discount to undivided dealers, 1 cent below tank-wagon price. In maritime provinces both divided and undivided dealers pay tank-wagon price.

Retail Price Changes

Standard Oil Co. (Indiana) March 23 advanced dealer gasoline .2 cent at Wichita.

Standard Oil Co. of Kentucky March 11 reduced tank-wagon and dealer gasoline 2.5 cents at Paducah; March 15 advanced tank-wagon and dealer gasoline 2 cents at Mobile.

Standard Oil Co. of Nebraska March 21 reduced tank-wagon kerosene .4 cent at North Platte.

Standard Oil Co. of Louisiana March 17 reduced tank-wagon kerosene 1 cent at Nashville.

Imperial Oil, Ltd., March 15 reduced tank-wagon gasoline 1.5 cents in Halifax and St. John to offset 2-cent increases in the gasoline tax which were effective March 15 in Nova Scotia and March 20 in New Brunswick.

New York Market

(Continued from Page 231)

ing week's price of $1.15 per barrel at most North Atlantic ports was unchanged.

Kerosene prices in New York harbor were quoted down to 5½ cents per gallon to the tankcar trade, although some suppliers continued to ask 5¾ cents. The demand was light, and seasonal conditions indicated that this first quality burning material will drift into still lower ground seeking its summer level.

Prices of Refined Products

All quotations f.o.b. plant in cars for interstate or export movement except as otherwise noted

Prices as of March 29, 1938

The following quotations are exclusive of the federal excise taxes of 1 cent a gallon on gasoline and 4 cents on lubricating oils.

Refinery Gasoline

OKLAHOMA (Group 3)—

U. S. Motor grades:		
62 oct. and below		.04½
63-66 octane	.04⅝	.04¾
67-69 octane	.04⅞	.05
70-72 octane (regular)		.05⅜
60-62 400 grades:		
62 oct. and below		.04½
63-66 octane	.04⅝	.04¾
67-69 octane	.04⅞	.05
70-72 octane (regular)		.05⅜
64-66 375	.04¾	.04⅞
68-70 360	.05	.05⅛

NORTH TEXAS—

U. S. Motor grades:		
62 octane and below		.04½
63-66 octane	.04⅝	.04¾
67-69 octane	.04⅞	.05
70-72 octane (regular)		.05⅜
60-62 400		.04½
64-66 375	.04¾	.04⅞

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)

U. S. Motor grades:		
62 octane and below	.04¼	.04½
63-66 octane	.04½	.04⅝
67-69 octane	.04⅞	.05
70-72 octane (regular)		.05½

ARKANSAS (Ark., N. La., Miss. del.)—

U. S. Motor grades:		
62 octane and below	.04¼	.04½
67-69 octane	.04⅞	.05
70-72 octane (regular)	.05½	.05⅝

CHICAGO (Based on Group 3)—

U. S. Motor grades:		
62 octane and below	.04⅜	.04⅝
63-66 octane	.04⅝	.04⅞
67-69 octane	.04⅞	.05⅛
70-72 octane (regular)	.05¼	.05½
60-62 400 grades:		
62 octane and below	.04⅜	.04⅝
63-66 octane	.04⅝	.04⅞
67-69 octane	.04⅞	.05⅛
70-72 octane (regular)	.05¼	.05½
64-66 375	.04¾	.05
68-70 360	.05	.05¼

PENNSYLVANIA (Inland refineries)—

58-60 U. S. Motor:		
Below 60 octane	.04⅞	.05⅛
65 octane	.06⅛	.06½
68-70 octane	.06⅝	.07⅛

CALIFORNIA (domestic movement)—

54-58 U. S. Motor	.06¾	.08¼
58-60 400, 65 oct. and higher	.08½	.09¼

EAST COAST (Domestic)—

U. S. Motor, 60-64.9 octane:		
New York (Bayonne)	.06¼	.06½
Philadelphia	.06¼	.06½
Boston	.06½	.06¾
Baltimore	.06½	.06¾
Charleston, S. C.	.07	.07¼
U. S. Motor, 65 and above:		
*New York (Bayonne)	.06½	.07
Philadelphia	.06½	.07
Boston	.06¾	.07
Baltimore	.07	.07¼
Charleston, S. C.	.07¼	.07½

*All grades of gasoline one-eighth to one-fourth cent less for barge shipments. New York harbor prices are for New York and New England delivery. Prices for New Jersey delivery one-fourth cent lower.

GULF COAST (domestic)—

U. S. Motor grades:		
Below 60 octane	.05	.05¼
60-64.9	.05¼	.05⅜
65 octane and higher	.05½	.05¾

Naphtha

PENNSYLVANIA (Inland refineries)—

52-56 450 (blending)	.04¾	.05

Natural Gasoline

OKLAHOMA (Group 3)—

Grade 26-70	.02½
Grade 18-55	.03

NORTH TEXAS—

Grade 26-70	.02½
Grade 18-55	.03

CALIFORNIA—

75-85 375-390	.06½	.07

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

Grade 26-70	.02⅞

Tractor Fuel

OKLAHOMA (Group 3)—

40-42 gr., 315-325 i.b.p., 110 flash, 540-550 e.p.	.04⅛	.04¼
41-43 gr., 300-520 i.b.p., 110-125 flash, 500-520 e.p.	.04¼	.04⅜
46-48 gr., 210-230 i.b.p., 480 max. e.p.	.04⅝	.04¾

Kerosene

(All kerosene water white)

OKLAHOMA (Group 3)—

41-43	.04⅛	.04¼
42-44	.04¼	.04⅜

NORTH TEXAS—

41-43	.04⅛	.04¼

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

41-43	.04⅜	.04½

ARKANSAS (Ark., N. La., Miss. del.)—

41-43	.04½	.04⅝

PENNSYLVANIA (Inland refineries)—

45	.05⅛	.05¼
46	.05¼	.05⅜
47	.05⅜	.05½

CHICAGO (Based on Group 3)—

41-43	.04⅛	.04⅜
42-44	.04⅜	.04⅝

CALIFORNIA (Pac. Coast market)—

38-43 high burning test	.05¼	.06½

NEW YORK (Bayonne, N. J.)—

41-43		.05¾

***GULF COAST (domestic)—**

41-43	.04⅝	.04¾

*Barge price one-eighth cent lower.

Furnace Oil

OKLAHOMA (Group 3)—

Range oil	.04	.04⅛
No. 1 prime white, 38-42	.03⅞	.04
No. 1 straw, 38-40	.03¾	.03⅞
No. 2 straw, 32-36		.03⅝
No. 2 dark, 32-36	.03⅜	.03½
No. 3 zero to 15, 28-32		.03⅜
No. 3, 15 and above, 28-32	.03	.03⅛

NORTH TEXAS—

No. 1 prime white, 38-42	.03⅞	.04
No. 1 straw, 38-40	.03¾	.03⅞

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

No. 2, 32-36	.03½	.03⅝

ARKANSAS (Ark., N. La., Miss. del.)—

No. 2, 32-36	.03¾	.03⅞

CHICAGO (Based on Group 3)—

Range oil	.04	.04⅛
No. 1 prime white, 38-40	.03⅞	.04⅛
No. 1 straw, 38-40	.03¾	.03⅞
No. 2 straw, 32-36	.03⅝	.03¾
No. 2 dark, 32-36	.03¾	.03⅝
No. 3, zero to 15, 28-32	.03⅜	.03½
No. 3, 15 and above, 28-32	.03	.03⅛

NEW YORK (Bayonne, N. J.)—

*No. 1		.05¾
*No. 2		.04¾
*No. 4		.04¾

*Barge deliveries one-eighth to one-fourth cent under above tankcar price.

Gas Oil and Fuel Oil

(Gas oil per gal.; fuel oil per bbl.)

OKLAHOMA (Group 3)—

U.G.I. gas oil	.02⅝	.02⅞
No. 4, low cold test, 24-28	1.10	1.15
No. 4, 15 and above, 24-28	.90	.95
No. 5, low cold test, 18-22	.72½	.77½
Below 18 fuel oil, industrial	.55	.60

NORTH TEXAS—

U.G.I. gas oil	.02⅝	.02¾
No. 4, low cold test, 24-28	1.10	1.15
No. 5, low cold test, 18-22	.72½	.77½
Below 18 fuel oil, industrial	.55	.60

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

10-14 fuel oil, industrial	.80	.85

CHICAGO (Based on Group 3)—

U.G.I. gas oil	.02⅞	.03⅛
No. 4, low cold test, 24-28	1.10	1.15
No. 4, 15 and above, 24-28	.90	.95
No. 5, low cold test, 18-22	.72½	.80
No. 5, 15 and above, 18-22	.60	.70
No. 6, low cold test, 10-16	.60	.70
No. 6, 15 and above, 10-16	.42½	.55

PENNSYLVANIA (Inland refineries)—

36-40	.04⅝	.04½

CALIFORNIA

Los Angeles:		
30-40 gas oil, per bbl.	1.30	1.50
24 plus diesel, per bbl.	1.35	1.50
24 plus diesel (bunkers)	1.40	1.60
12-16 (bunkers at tidewater)	.90	1.00
10-16 (cargo lots)	.90	1.00
12-17 (tankcars)	.75	1.00
10-17 (high sulfur)	.65	.95
San Joaquin Valley:		
10-18 (tankcars)	.60	.85
24 plus diesel, per bbl.	1.35	1.50
San Francisco:		
24 plus diesel, per bbl.	1.45	1.55
24 plus diesel (bunkers)	1.55	1.65
10-16 (bunkers)	1.00	1.05

GULF COAST—

28-30 gas oil	.04⅛	.04¼
28-30 diesel (bunkers)		1.90
Bunkers (bulk cargoes)		.85
Bunker C (bunkers)	.90	1.05

NEW YORK (Bayonne, N. J.)—

27 plus, gas oil		.04¾
28-30 diesel (lighterage 6¼c per bbl.)		1.85
28-30 diesel (tankcars)	.04¾	.05
Bunker C (to ocean-going ships in N. Y. harbor)		1.15
Industrial fuel (tankcars)	.04	.04¼

Lighterage charge 5c bbl. additional.

Bright and Steam Refined

OKLAHOMA (Group 3)—

Bright Stocks:		
190-200 D, 15-25		.19
150-160 D, 0-10		.16
150-160 D, 15-25		.15
150-160 E, 15-25		.14½
100-110 D, 0-10		.14½
Steam refined:		
631 green (treated)		.13½
600 dark green (untreated)		.05

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash):		
10 pour test	.18½	.19½
15 pour test	.17½	.18½
20 pour test	.16½	.17½
25 pour test	.15½	.16½
Steam refined:		
600	.08½	.09
650	.10½	.11½
600 Pennsylvania flash	.11	.13
630 flash	.14	.15
600 Warren E filtered	.13	.14

Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

Zero to 10 Cold Test:	
150-3	.09
180-3	.10
180-4	.09½
200-3	.10½
200-4	.10
250-3	.11½
250-4	.11
280-3	.12½
280-4	.12
300-3½	.13
400-3½	.14
100-2½ paraffin oil	.06
15-20 Cold Test:	
200-3	.10
200-4	.09½
250-3	.11
250-4	.10½
280-3	.12
280-4	.11½

GULF COAST—

Pale Oils:		
200-3	.07	.07¼
300-3	.07½	.07¾
500-3½	.08½	.08¾
750-3½	.08⅝	.09¼
1,200-3½	.09½	.09¾
1,500-4	.09¾	.10
Red Oils:		
200-5-6	.07¼	.07½
300-5-6	.07¼	.07½
500-5-6	.08	.08½
750	.08¾	.09
1,200-5-6	.09¼	.09½

CALIFORNIA (moving to dom. market)—

Pale Oils:		
100-2½-3	.07¼	.08
200-2½-3	.07¼	.08
300-2½-3	.07¼	.08
400-3-4	.07¼	.08
450-3-4	.07¼	.08
550-3-4	.09	.11
600-3-4	.09	.11
Red Oils:		
200-4-5	.07¼	.08
300-5-6	.07¼	.08
350-5-6	.09¼	.11½
400-5-6	.09¼	.11½
450-5-6	.09¼	.11½
500-5-6	.09¼	.11½
600-5-6½	.09¼	.11½
700-6½ plus	.09¼	.11½
750-6½ plus	.09¼	.11½
900-6½ plus	.09¼	.11½

PENNSYLVANIA—

150 vis. at 70° F. color, 400-405 flash:		
Zero pour test	.17½	.18
10 pour test	.16½	.17
15 pour test	.16	.16½
25 pour test	.15	.15½
180 vis. at 70° F., 3 color:		
25 pour test	.16	.16½
200 vis. at 70° F., 3 color:		
Zero pour test	.20½	.21
10 pour test	.19½	.20
15 pour test	.19	.19½
25 pour test	.17	.17½

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—

124-126 (a.m.p.) w.c. scale	.02¼	.02⅜

PENNSYLVANIA (Inland refineries)—

122-124 (a.m.p.) w.c. scale	.0195	.0200
124-126 (a.m.p.) w.c. scale	.0195	.0200

NEW YORK—

Wax in bags fully refined:		
122-125 (a.m.p.) wax		.0420
125-127 (a.m.p.) wax		.0435
128-130 (a.m.p.) wax		.0445
130-132 (a.m.p.) wax		.0455
133-135 (a.m.p.) wax		.0500
135-137 (a.m.p.) wax		.0515
124-126 (a.m.p.) w.s.	.0205	.0215
124-126 (a.m.p.) y.s.	.0200	.0210
Petrolatum in barrels, carload lots:		
Dark green	.02	.02⅛
Amber	.02⅜	.02½
Extra amber	.02⅝	.02¾
Lily white	.02⅛	.05¼
Snow white	.06⅛	.06¼
Cream	.04⅛	.04¼

Export Prices

GASOLINE

GULF COAST—

U. S. Motor	.04¾	.04⅞
60-62 400	.04¾	.04⅞
61-63 390	.04⅞	.05
64-66 375	.04⅞	.05

LOS ANGELES—

U. S. Motor grades:		
55-65 octane	.05¼	.05½
65-69 octane		.05¾
Above 69 octane		.06¼

KEROSENE

GULF COAST—

41-43 prime white	.04⅜	.04⅝
41-43 water white	.04½	.04¾
44 water white	.04⅞	.05

LOS ANGELES—

41-43 water white	.05	.05¼

LUBRICANTS

(Pennsylvania Grade)

NEW YORK (f.a.s. in bbls.)—

Cylinder Stocks:		
600 Warren E	.20½	.21
600 S.R. unfiltered	.16	.16½
630 S.R. unfiltered	.18	.18½
600 flash S.R.	.18½	.19
630 flash, S.R.	.21½	.22
Bright Stocks:		
8 color	.23	.23½
6½ plus color in dilution	.22½	.23

NEUTRAL OIL

200-3 color	.24½	.25
150-3 color	.22½	.23

PARAFFIN WAX

NEW YORK (prices per pound)—

123-126 a.m.p.		.0375
125-127 a.m.p.		.0387
128-130 a.m.p.		.0412
133-135 a.m.p.		.0437
135-137 a.m.p.		.0455
Crude Scale:		
124-126 w.s.	.0205	.0215
124-126 y.s.	.0200	.0210

CRUDE OIL PRICES

Oklahoma, Kansas, North Central and East Central Texas

(Effective January 28, 1937)

East Texas (May 22, 1937)*	$1.35
Van, Tex.†	1.10
Camp Hill, Tex.	1.27
Cass County, Tex.‡	1.25
Talco	.73
Altus and Tipton, Okla.§	1.20
Other fields (see gravity table).	

*All companies. †Humble Oil & Refining Co.; Pure Oil Co. ‡Texas Co. §Gulf Oil Co. Talco by Humble Oil & Refining Co.

West Texas

See gravity table.	
Pecos County*	$ .91
Pecos shallow†	.81

*Shell Petroleum Corp., Gulf Pipe Line Co. and Humble Oil & Refining Co. †Shell Petroleum Corp.

Rocky Mountain States

(Effective January 28, 1937)

Iles, Colo., light*	$1.18
Iles, Colo., heavy*	1.12
Greybull, Wyo.*	1.30
Torchlight, Wyo.*	1.30
Grass Creek, Wyo., light*†	1.30
Grass Creek, Wyo., heavy (Nov. 4, 1936)*†	.62
Hamilton Dome, Wyo. (Jan. 1, 1937)*	.67
Elk Basin, Wyo., light*†	1.30
Frannie, Wyo., heavy*	.62
Frannie, Wyo., light	.70
Hogback, N. M. (Jan. 28, 1937)*	1.33
Salt Creek, Dutton Creek and Midway, Wyo., take Stanolind's Oklahoma prices on a gravity basis.	
Big Muddy, Wyo.†‡	1.23
Rock Creek, Wyo.†	1.20¼
Lea County, N. M. (see West Texas gravity table).	
Artesia, N. M. (Jan. 28, 1937)‡	.90
Maljamar, N. M. (Jan. 28, 1937)‡	.90
Canon City and Florence, Colo.	1.10
Lance Creek, Wyo.	.97
Lander, Wyo. (Jan. 1, 1938)§	.51¼
Sunburst, Mont. (Nov. 16, 1937)†	.90
Cat Creek, Mont. (Jan. 1, 1938)‡	$1.30
Garland, Wyo. (Jan. 1, 1937)†	.50

*Stanolind Oil & Gas Co. †Ohio Oil Co. ‡Continental Oil Co. §Hudson Oil Co.

Southwest Texas

(Effective January 28, 1937)

Pettus	$1.37
Salt Flat, Darst Creek, Hilbig, Carroll, Clark, Zoboroski	1.09
Lytton Springs	1.12
Luling	1.00

Saxet and Taft take same gravity table as Gulf Coast.

North Louisiana and Arkansas

Smackover, all grades	$ .90
Tullos and Urania	1.02
El Dorado East field	.90
Union County, Ark.	.90
Ouachita County, Ark.	.90
Lisbon, La. (Dec. 13, 1937)*	.98

*Caddo Crude Oil Purchasing Co.

Gulf Coast

(Effective January 28, 1937)

Choctaw and Darrow, La. See note below	
Clay Creek, Tex.	$1.00
Garden Island, La.	1.37
Cleveland, Tex.	1.27
Hardin, Tex.	1.15
Lafitte, La.	1.24
Livingston, Tex.	1.27
Welsh, La.	.98
Tepetate (La.) (Jan. 28, 1937)	1.24

Duval, Jim Hogg, Webb and Zapata counties, Texas, and Heyser and Placedo fields take Mirando gravity prices. Jennings, La., 5 cents lower than Gulf Coast prices on each degree. Segno, Texas, takes Gulf Refining Co.'s Gulf Coast prices. Choctaw and Darrow, Louisiana, posted for first time by Standard Oil Co. of Louisiana, start below 21 degrees at 90 cents, with 3-cent differential up to 25 gravity, then 2-cent differential up to 40 and above, $1.36. Effective October 1, 1937, Stanolind Oil & Gas Co. in Evangeline, La., pays 92 cents for below 20 gravity, adding 2 cents for each degree upward to 40 and over, at $1.34.

Middle Western States

OHIO OIL CO.
(Effective January 28, 1937)

Lima	$1.00
Illinois	1.35
Princeton, Ind.	1.35
Midland, Mich. (Jan. 5, 1938)*	1.12
West Branch, Mich. (Dec. 29, 1937)†	.80
Buckeye (Jan. 8, 1938)	1.09¼
Arenac, Mich. (Dec. 29, 1937)†	.80
Muskegon, Mich.	1.00
Eastern Kentucky:	
Big Sandy River	1.42
Kentucky River	1.50
Western Kentucky	1.40

*Posted by Pure Oil Co.
†McClanahan P. L. and Simrall.
Midland, Mich., price posted by Simrall Corp. and Pure Oil Co. includes Greendale, Porter, Beaverton, Crystal and equal grades. West Branch and Arenac by Simrall Corp. Eastern Kentucky crude purchased by Ashland Refining Co., Ashland, Ky. Buckeye posted by Simrall Corp. and Pure Oil Co.

Eastern States

TIDE WATER ASSOCIATED OIL CO.
(Effective March 7, 1938)

Bradford, Pa.	$2.05
Allegany, N. Y.	2.05

SOUTH PENN OIL CO.
(Effective March 7, 1938)

Pennsylvania Grade Oil in National Transit Lines (Bradford field)	2.05
Pennsylvania Grade Oil in Southwest Pennsylvania Lines	1.71
Pennsylvania Grade Oil in Eureka Pipe Line lines	1.65
Pennsylvania Grade Oil in Buckeye Pipe Line lines	1.55
Corning Grade Oil in Buckeye Pipe Line Co.'s lines	1.27

PENNZOIL CO.
(Effective March 7, 1938)

Pennsylvania Grade Oil in National Transit Lines:	
Group A	1.98
Includes Cochran, Franklin, Hamilton and Doolittle districts.	
Group B	1.97
Includes Tidioute district.	
Group C	1.96
Includes Turkey and Tidioute districts.	
Group D	1.95
Includes Bear Creek and Porkey districts.	
Group E	1.93
Includes Eldeneau, Bull Creek, Rough Run, Carbon, Dipner, Bredlin, McJunkin, Jameson, Kenerdell, Emienton, Tiona, Lacey and Kinzua districts.	

PURE OIL CO.
(Effective March 7, 1938)

Cabin Creek, W. Va.	$1.65
Bradford Hollow, W. Va.	1.65
Kelly Creek, W. Va.	1.65

Canada

Ontario (Sept. 9, 1933)*

Petrolia	$2.10
Oil Springs	2.17
TURNER VALLEY NAPHTHAS AND CRUDE OIL (January 5, 1938, by Imperial Oil, Ltd.)	
Clear naphtha and discolored naphtha, 65 gravity and higher	$2.14
Discolored naphtha and crude oil, 40-40.9 gravity	1.14
Increasing 2 cents for each degree gravity with top price for 64-64.9 gravity	1.62
These prices f.o.b. producers field tankage.	

*Imperial Oil, Ltd.

Mexico

Heavy Mexican crude	$.85

*In U. S. currency, f.o.b. ship, based on February spot market transactions.

Rocky Mountain Runs

Production estimates for the week ended March 26 follow:

	Bbls.
WYOMING	
Salt Creek	16,010
Big Muddy	1,290
Badger Basin	190
Black Mountain	100
Byron	4,900
Dallas Derby	560
Dutton Creek	60
Elk Basin	10
Frannie	980
Garland	1,860
Grass Creek	10
Hidden dome	150
Hudson	290
LaBarge	900
Lance Creek	9,930
Lost Soldier	1,530
Medicine Bow	3,580
Midway	40
Oregon Basin	1,990
Osage	890
Pilot Butte	20
Quealy dome	820
Rex Lake	40
Rock River	2,460
South Casper	490
Poison Spider	280
Teapot	20
Warm Springs	80
Wertz	860
Total Wyoming	50,340
MONTANA	
Border	80
Cat Creek	640
Cut Bank	6,500
Dry Creek	280
Kevin-Sunburst	3,320
Lake Basin	20
Pondera	1,170
Total Montana	12,010
COLORADO	
Florence	160
Fort Collins and Wellington	300
Iles dome	2,510
Moffat	390
Orchard	50
Rangely	80
Tow Creek	180
Price	510
Total Colorado	4,180
NEW MEXICO	
Cooper	5,010
Eaves	960
Eunice	26,270
Hardy	1,710
Hobbs	15,630
Jal	1,270
Langlie	3,330
Lynch	620
Lynn	920
Mattix	2,640
Monument	27,830
North Lynch	50
Penrose	5,060
Rhoades	90
Skelly	1,880
South Eunice	2,870
Vacuum	670
Artesia-Maljamar	7,160
Getty	200
Hogback	200
Rattlesnake	670
Table Mesa	90
Total New Mexico	105,030
Total Rocky Mountain region	171,560

Crude Prices by Gravities

	Oklahoma-Kansas	Oklahoma-Kansas	North and Central Texas	East Central Texas (Mexia district)	North Louisiana-Arkansas	Gray County, Texas	Hutchinson-Carson counties, Texas	Rodessa, Louisiana-Texas and Panola County, Texas	Conroe, Tomball, Raccoon Bend, (Deep) Saltsuma	Gulf Coast	Gulf Coast	Lea County, N. Mex. West Texas except Pecos County	Mirando district, Texas	Marion County, Texas	Refugio, Greta, Saxet, Taft, Texas	Anahuac, Flour Bluff, Dickson, Turtle Bay	White Castle, Louisiana	Iowa, Louisiana	Cayuga, Texas
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Bel. 18	....	....	....	....	....	....	....	....	....	$.90	....	....	....	....	....	....	....	$.90	....
18-18.9	....	....	....	....	....	....	....	....	....	.92	....	....	....	....	....	....	....	.92	....
19-19.9	....	....	....	....	....	....	....	....	....	.94	....	....	....	....	....	....	$.94	.94	....
20-20.9	....	....	....	....	....	....	....	....	....	.96	$.95	....	$.96	....	$1.01	....	.96	.96	....
21-21.9	....	....	....	....	....	....	....	....	....	.98	.98	....	.98	....	1.03	....	.98	.98	....
22-22.9	....	....	....	....	....	....	....	....	....	1.01	1.01	....	1.00	....	1.05	....	1.01	1.01	....
23-23.9	....	....	....	....	....	....	....	....	....	1.04	1.04	....	1.02	....	1.07	....	1.04	1.04	....
24-24.9	....	....	....	....	....	....	....	....	....	1.07	1.07	....	1.04	....	1.09	....	1.07	1.07	....
Bel. 25	....	$ .98	....	....	$.90	....	....	$.93	....	....	....	....	....	$.90	....	....	....	....	$.88
25-25.9	....	1.00	....	....	.92	....	....	.95	....	1.10	1.10	$.78	1.06	.92	1.11	....	1.10	1.10	.90
26-26.9	....	1.02	....	....	.94	....	....	.97	....	1.13	1.13	.80	1.08	.94	1.13	....	1.13	1.13	.92
27-27.9	....	1.04	....	....	.96	....	....	.99	....	1.16	1.15	.82	1.10	.96	1.15	....	1.15	1.15	.94
28-28.9	....	1.06	....	....	.98	....	....	1.01	....	1.17	1.17	.84	1.12	.98	1.17	....	1.17	1.17	.96
Bel. 29	$1.06	....	$.96	$1.03	....	....	....	....	$1.20	....	....	....	....	....	....	....	....	....	....
29-29.9	1.08	1.08	.98	1.05	1.00	....	....	1.03	1.22	1.19	1.19	.86	1.14	1.00	1.19	....	1.19	1.19	.98
30-30.9	1.10	1.10	1.00	1.07	1.02	....	....	1.05	1.24	1.21	1.21	.88	1.16	1.02	1.21	$1.16	1.21	1.21	1.00
31-31.9	1.12	1.12	1.02	1.09	1.04	....	....	1.07	1.26	1.23	1.23	.90	1.18	1.04	1.23	1.18	1.23	1.23	1.02
32-32.9	1.14	1.14	1.04	1.11	1.06	....	....	1.09	1.28	1.25	1.25	.92	1.20	1.06	1.25	1.20	1.25	1.25	1.04
33-33.9	1.16	1.16	1.06	1.13	1.08	....	....	1.11	1.30	1.27	1.27	.94	1.22	1.08	1.27	1.22	1.27	1.27	1.06
34-34.9	1.18	1.18	1.08	1.15	1.10	....	....	1.13	1.32	1.29	1.29	.96	1.24	1.10	1.29	1.24	1.29	1.29	1.08
Bel. 35	....	....	....	....	....	$.96	$.91	....	....	....	....	....	....	....	....	....	....	....	....
35-35.9	1.20	1.20	1.10	1.17	1.12	.98	.93	1.15	1.34	....	1.31	.88	1.26	1.12	1.31	1.26	1.29	1.29	....
36-36.9	1.22	1.22	1.12	1.19	1.14	1.00	.95	1.17	1.36	....	1.33	1.00	1.28	1.14	1.33	1.28	1.29	1.29	....
37-37.9	1.24	1.24	1.14	1.21	1.16	1.02	.97	1.19	1.38	....	1.35	1.02	1.30	1.16	1.35	1.30	1.29	1.29	....
38-38.9	1.26	1.26	1.16	1.23	1.18	1.04	.99	1.21	1.40	....	1.37	1.04	1.32	1.18	1.37	1.32	1.29	1.29	....
39-39.9	1.28	1.28	1.18	1.25	1.20	1.06	1.01	1.23	1.42	....	1.39	1.06	1.34	1.20	1.39	1.34	1.29	1.29	....
40,over	1.30	1.30	1.20	1.27	1.22	1.08	1.03	1.25	1.44	....	1.41	1.08	1.36	1.22	1.41	1.36	1.29	1.29	....

Column 1—Companies posting are Barnsdall, Bell, Champlin, Continental, Cushing, Derby, Bay, Eason, El Dorado, Cities Service, Falcon, Globe, Gulf, Johnson, Kanotex, National, Phillips, White Eagle, Stanolind, Sunray, Texas, Sun Vickers and Wilcox.
Column 2—Anderson & Prichard, Carter, Cosco, Deep Rock, Magnolia, Mid-Continent, Pure, Rock Island, Shell, Sinclair, Skelly and Tide Water.
Column 3—All purchasers.
Column 4—Humble Oil & Refining Co. and Sinclair Oil Purchasing Co.
Columns 5, 6, 7 and 8—All purchasers.
Column 9—Humble Oil & Refining Co. and Sun Oil Co. Tidewater Oil Co.'s schedule starts at 35 degrees, $1.34 with 2-cent spread up to 40 and over at $1.44. (Raccoon Bend prices are for deep sand oil.)
Column 10—The Texas Co. (Gulf Refining Co. pays same prices up to and including 34 gravity, but continues its 2-cent spread up to 40 and over at $1.41.)
Column 11—Humble Oil & Refining Co., Sinclair Prairie Oil Marketing Co., Sun Oil Co.
Column 12—All purchasers.
Column 13—All purchasers (effective July 6, 1937).
Column 14—Magnolia Petroleum Co.
Column 15—Humble Oil & Refining Co. (effective July 6, 1937).
Column 16—Humble Oil & Refining Co.
Columns 17 and 18—Shell Petroleum Corp.
Column 19—Tide Water Oil Co.

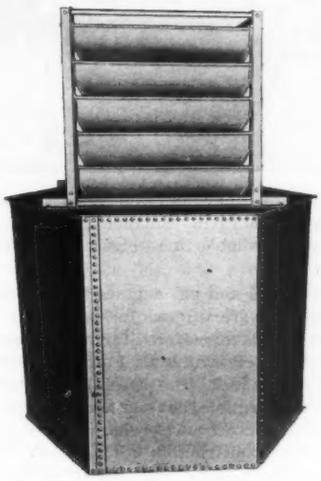
Kansas Well Spacing

Hearing on the first petition for well spacing to be filed in Kansas will be held before the Corporation Commission at Wichita April 7. The petitioners seek establishment of drilling units and spacing of wells in sections 10 to 15, 22 to 27, and 34 to 36 in Township 24-11w, comprising the Zenith area in eastern Stafford County. Operators in the area, who presented the petition, are Stanolind Oil & Gas Co., Continental Oil Co., Tide Water Associated Oil Co., E. H. Moore, Inc., and Pure Oil Co.

New or Improved Equipment

Cooling-Tower Is Built for Easy Erection and Dismantling

A new cooling-tower announced by Surface Equipment Co., 524 North Trenton Avenue, Tulsa, cools any kind of engine up to 60 horsepower. The



unit can be erected or knocked down easily with unskilled labor. It is hexagon-shaped, rigid, and will not leak, bulge or spring out of shape. The tank capacity is 60 barrels. The complete cooling-tower can be shipped in a box 8 by 4 by 2 feet.

The tank is braced at the top with heavy angles, and each seam is reinforced with structural channels which hold the head of the bolts. A spray head distributes the water. Weight of the cooling-tower is 1,250 pounds. It is made of 12-gauge copper-alloy steel and painted with chromic red iron oxide with a finishing coat of aluminum. Surface Equipment Co. also is manufacturing a cooling-tower with a square welded tank.

Here and There With Men Who Manufacture Equipment

Chiksan Oil Tool Co., Ltd., Fullerton, Calif., has opened an office in the Shell Building, Houston, Tex. Herb Maland, Chiksan's chief engineer for years, is in charge.

Wallace H. Rowe, Jr., has been appointed district sales manager of the Los Angeles office of Pittsburgh Steel Co. Mr. Rowe is a son of the late Wallace H. Rowe, one of the company's founders and has been a sales representative in Pittsburgh, Pa.

Two additional branch stores have been opened by Continental Supply Co., Dallas, Tex. One is in Centralia, Ill., under the direction of F. W. George, and one in Houma, La., with Thomas J. Holmes, Jr., as manager. Mr. Holmes, who formerly was store manager at New Iberia, is succeeded by J. A. French.

W-K-M Co., Inc., Houston, Tex., is now exclusive distributor for the oil-field water-softeners manufactured by Continental Chemical Co., Sand Springs, Okla., for steam drilling rigs and gas, gasoline, or diesel powered rigs.

George T. Mahaney and James D. Platt have been appointed western retail sales managers, respectively, of the diesel engine division, General Motors Sales Corp. The two, whose territories will be divided roughly by an imaginary line extending from Mobile, Ala., northward through Chicago and Milwaukee, will maintain offices at the headquarters of the new diesel division in Cleveland, Ohio.

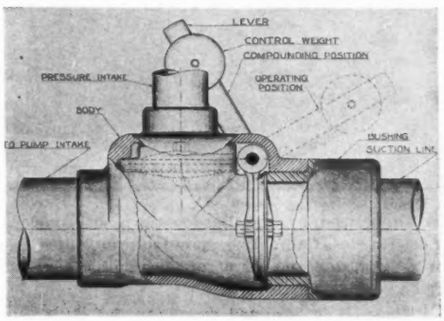
New Clay-Processing Works Is Started by Quality Earths

A plant for the manufacture of bleaching clays has been completed and put in operation by Quality Earths, Inc., Mobile, Ala. The plant has a pulverizing and granulating mill, powered with a diesel motor of 125 horsepower. The clay is dried by indirect heat, using fuel oil for the heating, which is automatically controlled by thermostatic equipment.

A towering mass of almost pure clay is located directly in the rear of the mill, so that the product can be delivered by gravity to the preliminary crusher. This deposit has been inspected and tested by government officials and reported as a high-grade material suitable for the many uses connected with the manufacture of oils. Certain strata have been found satisfactory as a drilling-mud constituent. Uses for which the clay is adapted include, clarification of mineral and vegetable oils, decolorization and clarification of diesel and fuel oils, as a catalyst in treating gasolines, and treatment of crankcase oils. C. C. Ruprecht is technologist and chief engineer. M. J. Epley is president and general manager.

New American Valve Designed to Meet Blowout Troubles

A new automatic compound suction valve, designed to compound slushpumps for drilling wells by the rotary method, is announced by the American Iron & Machine Works Co., of Oklahoma City. The valve is of high value where blowouts are encountered in drilling wells and where blowouts

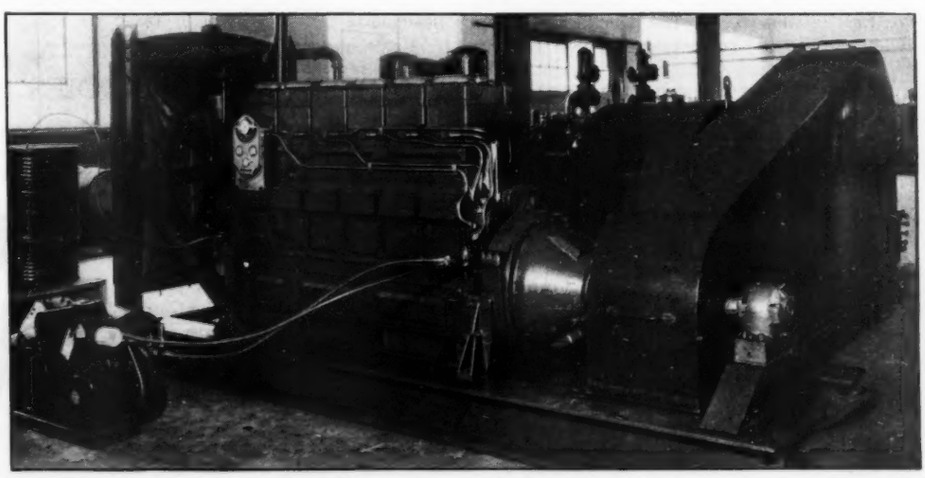


would have to be mudded off by creating compound pressures of both pumps. It is very practical in pumping down cement or other substances where extreme pump pressures are required. The valve is made of the best grade of steel, with a safety factor in excess of actual requirements.

A mailing-piece offered by Homestead Valve Manufacturing Co., Inc., Coraopolis, Pa., is devoted to Homestead lift-plug valves.

NEW TYPE PORTABLE DIESEL DRILLING RIG DELIVERED

A four-engined portable diesel drilling rig recently delivered by Wagner-Morehouse, Inc., Los Angeles, oil-well equipment supplier, to one of the major oil companies consists of two high-speed



Cummins diesel power units of the LP-601 type, which drive Gardner-Denver pumps, and a two-engine drilling rig built by the Portable Rig Co. The rig is powered by two Cummins diesels of the LI-600 type. The engines for the pumps and the drilling rig each develop 200 horsepower at 800 r.p.m. and are identical with the scores of Cummins diesels in the Texas and Oklahoma oil fields. Wagner-Morehouse, Inc., is distributor for Gardner-Denver pumps as well as the Portable Rig Co.'s products. The entire plant was delivered three weeks after placing of the order.

The two Cummins LP-601 units which drive the pumps are mounted on structural-steel skid-type bases. At one end are the Young cooling radiators and fan assembly, and at the other end the Twin Disc clutches and Vee belt sheaves. An SKF bearing is at the extreme end of the base, to support the pulley-shaft. These Cummins diesels feature the low-pressure, distributor-type fuel-injection systems which gasify the fuel before injection.

The two engines, which drive the slushpumps, were tested and assembled at the Wagner-Morehouse plant in Los Angeles before delivery.

Bardco Introducing Power Unit for Refinery and Field Use

Introduction of a new power unit for operators of compressors, pumps, hoists, welders, pumpjacks and other oil-field and refinery equipment

is announced by the Bardco Corp. of America, Los Angeles, Calif. The manufacturer states that it will produce power at one-third of a cent per horsepower hour.

The unit is designed compactly for either stationary or portable service. Choice may be had of Ford V-8 or diesel engines, and fuel may be natural or artificial gas, gasoline, distillate, butane, or diesel fuel.

Features include the oversize oil re-refining unit, which saves oil-drains eliminating carbon, excess dilution and acid, and the completely automatic safety controls, which protect the equipment from low oil and water supply. In case of danger, the engine is stopped by the safety controls, and they can be set to give a warning signal at any predetermined point.

Bulletins, Booklets and Other Literature for the Trade

"Electric Drive Selector and Hints on Maintenance" is the title of a 12-page publication prepared by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The pamphlet describes and illustrates the requirements which must be met in choosing a motor.

"John Crane" conical self-aligning packing-glands are described in a bulletin offered by Crane Packing Co., 1800 Cuyler Avenue, Chicago.

A bulletin announced by Shenango-Penn Mold Co., Dover, Ohio, on the company's centrifugal castings, supersedes its No. 134-A.

National Safety Council, Inc., 20 North Wacker Drive, Chicago, is mailing on application copies of "A Balanced Fleet Safety Program," prepared for oil companies, sales and service organizations, public utilities, bus lines, etc.

"Oilwell" flexible-blanket insulation to reduce heat losses on oil-field boilers is the subject of a four-page bulletin prepared by the Oil Well Supply Co.

Helpful suggestions for the man interested in arc welding fill the latest issue of the Welder's Stabilizer, published by the Lincoln Electric Co., Cleveland, Ohio, "for welders who take pride in their jobs."

Among articles in the current issue of Baldwin-Southwark, published quarterly by Baldwin-Southwark Corp., Philadelphia, Pa., is one discussing diesel engines, and particularly the new model VM diesel announced by the De La Vergne Engine Co., Philadelphia. "There probably never will be a time," it says, "when the diesel engine designer can safely rest on his laurels."

Under the designation "Data 50," Aldrich Pump Co., Allentown, Pa., has prepared a 22-page booklet containing hydraulic tables and engineering information useful to engineers, to whom it is sent on request.

"Your 10 demandments are the Hyatt 10 commandments," says a 26-page booklet, illustrated in colors, obtainable from branch offices of the Hyatt Bearings Division of General Motors Corp.

Manual By-Pass Is New Feature

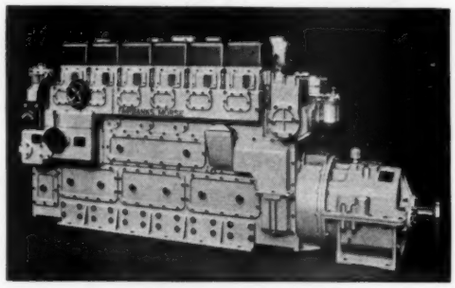
A new feature added to the Taylor Fulscope Micromax controller, manufactured by Taylor Instrument Companies, Rochester, N. Y., is the manual by-pass, now standard equipment on these controllers, according to announcement. It is particularly desirable on some applications to start the apparatus on hand control and "cut in" automatic control as the operating temperature is reached. When hand operation is required, the manual by-pass enables the operator to change the controlling-medium input at the instrument where its effects are recorded. Furthermore, it permits adjustments or repairs to the instrument without unduly disturbing the heat balance in the apparatus. Change-over from manual to automatic control, or vice versa, is simple.

District Manager For Continental

Appointment of Ross Brewer as district manager of the West Texas and New Mexico district of the Continental Supply Co. was announced at the company's home office in Dallas, Tex. Mr. Brewer, whose entry into the supply business began with Continental in Oklahoma in 1919, has a wide acquaintance with Mid-Continent oil men. He has served as assistant district manager since 1930, and will continue to make his headquarters in Fort Worth, Tex.

Convertible Gas-Diesels Are Offered by Fairbanks-Morse

Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago, has announced a series of four-cycle, vertical, convertible diesel and gas engines. This new model 36-A-8 size is designed to fill the need for sturdy, medium-speed engines in the 200- to 300-horsepower range. Built in both 6- and 8-cylinder combinations, with 8-inch bore and 10½-inch stroke, they develop 35-horsepower per cylinder at 720 r.p.m. Smaller sizes of model 36-A diesel are available in ratings as low as 8-horsepower.



Both diesel and gas engines in the new 8-inch cylinder size are offered for stationary service, and the diesels are offered for marine propulsion and in complete unit-built Fairbanks-Morse generating sets as well. The diesels for marine service are direct-reversible, but can be furnished as non-reversible where such service requires.

En block construction is employed, with individual cylinder liners, precision main, connecting-rod and camshaft bearings, and suspended or "underslung" crankshaft. Side cover-plates permit easy accessibility to main and connecting-rod bearings. The design permits double-end drive or power take-off from either end, a distinct advantage in certain types of application.

New Line of Electrodes

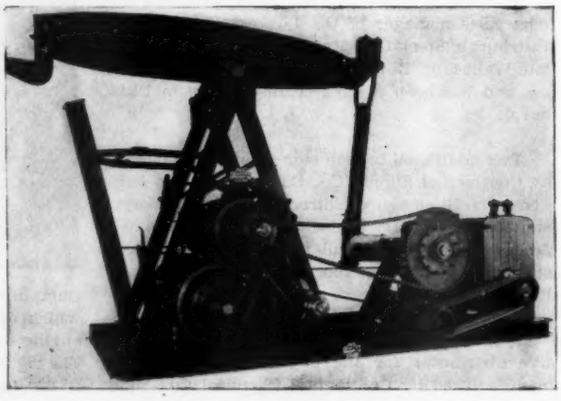
A line of shielded-arc welding electrodes, claimed by the manufacturer to be quieter in operation, faster in welding time, producing finer bead appearance, and having greater adaptability per rod, is offered by the McKay Co., Pittsburgh, Pa. The makers say that, while the new electrodes are of an improved type, no changes in operating practice are required.

SHAFFER UNIT EMBODIES NEW WALKING-BEAM DESIGN

The Shaffer Specialty Co., 2440 East King Street, Tulsa, announces a cable-tool servicing unit with standard beam action accomplished without switching lines or interfering with drilling and sand lines. This portable unit incorporates a new design in walking-beams which overcomes the difficulty encountered where the beam obstructs the lines from passing back and forth across the face of the drums.

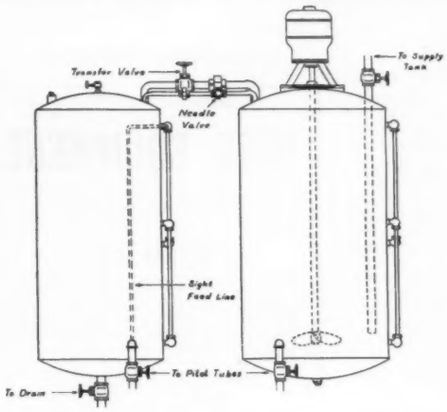
The Shaffer double walking-beam includes two wide-flange I-beams joined at the crank and temper-screw ends with an oval opening between the ends for free passage of the lines to prevent spooling without disturbing the normal position of the beam. The members are spaced to divide the load on two sampson-posts, preventing twisting or misalignment of the beam. The walking-beam, thus mounted on double sampson-posts, is said to eliminate the shock load of the beam and prevent misalignment of drum-shafts or bearings.

The unit is comparable in operation to conventional cable-tool units, furnishing a safe and efficient beam operation for drilling. The shock load of spudding over the derrick as well as excessive wear on drilling lines is said to be eliminated. Beam operation also is said to allow better pumping potentials. The unit can be used for rotary drilling by converting the crankshaft drive to the rotary table.



Proportioning Machine of New Type Announced by Haering

D. W. Haering & Co., Inc., 3408 Monroe Street, Chicago, announce a new type proportioning machine employing the Haering fluid-piston prin-



ciple for the proportioning of mixtures of suspended matter. This new unit provides the accuracy of the H-O-H feeders for the proportioning of lime and similar suspended chemicals.

The model S feeder is equipped with an agitator installed in the reagent compartment, which is so designed and installed as to permit the continuous agitation of the reagent without danger of emulsifying the oil. Lime and similar chemicals can be carried in suspension and proportioned accurately.

Compartment A is filled with red oil and compartment B with the chemical solution. The machine is direct-connected to pitot tubes and these valves are opened to place the machine in operation. The agitator is started from a control switch and kept operating all the time the unit is feeding.

Water rises in compartment A into the upper gauge fitting and drops through the oil, displacing the oil across a needle-valve control and into compartment B, where in turn it displaces the chemical suspension into the line. As oil enters the tank B it floats on the surface of the suspension while gradually displacing it and at no time passes through the reagent. The difference in capacity of tanks A and B is increased above normal to prevent the oil level in tank B ever reaching the high-velocity area of agitation.

R. D. Kenny Appointed by Ross

Dewey T. Ross Engineering Co., Houston, Tex., announces the appointment of R. D. Kenny as its Louisiana and Gulf Coast representative. Mr. Kenny entered the oil business at Ranger, Tex., in 1919 immediately after leaving the United States Army air service at Barron Field.

New Electrode Is Developed for Welding Manganese Steel

The Harnischfeger Corp., 400 West National Avenue, Milwaukee, Wis., announces Smootharc "Harmang," another in its long line of Smootharc welding electrodes. Designed for welding on parts subject to heavy impact, such as manganese castings, railroad frogs and crossings, dipper teeth, etc., "Harmang" is said to supply the necessary toughness and hardness. Its base metal is nickel manganese steel, ranging from 11 to 14 per cent nickel manganese and 3½ to 4½ per cent nickel. Carbon content is in excess of 1 per cent.

The slag coating which stabilizes the arc and protects the metal against loss of carbon and manganese is kept to a minimum, so as not to interfere with the rapid cooling required to form an austentitic deposit. With cold working, such as hammering and peening, the soft manganese deposit becomes an extremely hard martensite layer, which offers great resistance to impact and abrasion. Smootharc "Harmang" operates with the work negative and the electrode positive, and is built in sizes from one-eighth inch to one-quarter inch diameter, for use with currents ranging from 90 to 140 amperes.

Three New Equipment Products

Three additions have been made to the line of Thermoid industrial rubber products by the Thermoid Co., Trenton, N. J. Thermoid tank-truck hose has a molded and braided construction and is recommended for loading and unloading distillates, fuel oils. etc., in tank-truck service. Both the tube and cover are highly oil-resistant. Thermoid gasoline hose is constructed with specially compounded Neoprene tube to resist the softening action of gasoline. A special cover stock resists checking action of the sun.

A high-carbon steel wire is woven into the carcass, providing strength to resist crushing and flexibility to withstand twisting without kinking. Thermoid V belts are made to give a shock-absorbing action and to eliminate practically all belt stretch.

Marmon-Herrington in Canada

Marmon-Herrington Co., Inc., Indianapolis, Ind., manufacturer of all-wheel-drive trucks and passenger cars, has announced completion of arrangements to manufacture all-wheel-drive vehicles at two strategic points in Canada. To serve western Canada a factory will be located at 650 Burrard Street, Vancouver, British Columbia, under the name of Truck Parts & Equipment, Ltd. The territory from the prairie provinces to the maritime provinces will be served by Canadian Traction, Ltd., 1396 Saint Catherine Street, West, Montreal, Quebec.

Well Fluid Displaced Without Dilution by New Dale Dump

Dale Service Corp., 3520 Schaeffer Street, Culver City, Calif., is now marketing the new Dale cement dump, an improved type of bailer bottom specifically designed to dump cement in a well at any desired level without dilution of the cement mix by the well fluid.

The chief advantage to the operator claimed by the manufacturer is that the dump has an unusually free dumping action which enables the cement to displace the well fluid without becoming mixed with it, as the bailer is raised. Thus the cement mix is not diluted or contaminated by the muddy or oily well fluid, and the whole column of cement is said to set up in a compact mass with uniform and exceptionally high strength.

The cement emerges from the very bottom of the body, through a hole that is of the same size as the full inside diameter of the bailer bottom. There are no valves or orifices inside the body to restrict the flow of the cement out of the bailer, thus the hazard of the cement bridging in the bailer and being later released accidentally as the bailer is being pulled to the surface is eliminated.

The dump consists of a tubular body which can be attached to the lower end of a bailer made up of ordinary tubing or casing. The interior of the body is unobstructed by valves, orifices, or other restrictions. While being run into the hole the opening in the lower end is closed by a thin disc, which is held in place to retain the load of cement by pivoted trip levers attached to the body. The trip levers are actuated by a sliding collar encircling the body, attached to replaceable friction springs of the proper size to contact the wall of the casing or liner in which the cement is to be dumped. This method of dumping enables the operator to trip the mechanism at any point he desires, and prevents accidental dumping while running in the hole.

CRANE FITTINGS HAVE TURNED FROM PIGSKIN TO PUCK

Those same rugged brass fittings which, as football players, scored countless touchdowns for Crane Co., Chicago, last fall, are now burning up the ice as hockey players for Crane, Ltd., Montreal. The "men of mettle" seem to be as deft in handling the puck as they were with the pigskin.

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Patent Attorneys

JACK A. SCHLEY
PATENT LAWYER

Patents obtained — infringement practice in all Courts—oil field experience. 1807-11 Tower Petroleum Bldg., Dallas. 2014 Second Nat'l. Bank Bldg., Houston. 707 Insurance Building, San Antonio. 433 Munsey Building, Washington, D. C. Address any of these offices.

PATENTS — TRADE MARKS

All cases submitted given personal attention by members of the firm. *Form "Evidence of Conception" and instructions*
"How to Establish Your Rights"—Free

LANCASTER, ALLWINE & ROMMEL
Patent Law Offices
418 Bowen Bldg. Washington, D. C.

For Sale—Maps

1938 REVISED EDITION
MAP of State of Texas, Eastern N. M., parts of Southern Okla., SW Ark. and La., shows Oil and Gas Fields in color, Counties, County Seats, elevations, coordinated alphabetical index of counties and fields
Price $1.00 postpaid

Write for descriptive folder of Oilfield and County Ownership Maps.

ZINGERY OIL MAP COMPANY
Fair Building Fort Worth

Leases and Drilling Blocks

QUICK action wanted on McClosky well on seismograph structure in No. 1 location Illinois Basin for percentage of acreage. Address Box J-310, The Oil and Gas Journal, Tulsa, Oklahoma.

PARTY desires to sell stock and interest in oil producing acreage in San Juan Co., New Mexico. Address Box J-323, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES—ROYALTIES near Ordovician wildcat semi-proven offers reasonable chance play safe quick money. E. CROFT, PROCTOR, TEXAS.

ATTENTION
Let us help you sell your lease or royalty. Oil Property Advertising Sales Co., Box 2603, Tulsa, Oklahoma.

WE HAVE for sale 4 oil wells producing approximately 18 barrels per day from a 2100' horizon. We have a gas well furnishing fuel for pumping three of these wells. Equipment all in A-1 condition. For further details see either J. E. Gillespie of Moline, or write C. H. Collins, Herington, Kansas.

FOR SALE — One hundred or more acres, with gas well and some oil, shallow production. Price reasonable for some party who will drill additional wells. Address Box 1098, Shawnee, Oklahoma.

DO YOU WANT PRODUCTION? I am ready to drill a Bartlesville shallow well, production on the adjoining acreage, also on the diagonal acreage. Will sell one half interest in the well drilled through the sand on a 160 acre lease for $1600.00. Wells come in for from 50 to 100 bbls., 20 to 30 feet of pay, depth about 750 feet. Address Box 44, Wellington, Kansas.

SECURITY ABSTRACT COMPANY
El Dorado, Arkansas
Fee, Lease & Mineral Ownership
on short notice. Ownership maps

A "Complete" service on developments Texas Panhandle Field. Reasonable Monthly rates, one or all Counties. Dwight Well Log Service, Rule Bldg., Amarillo, Texas.

TELL ME your wants in drilling blocks, leases, production in North Louisiana. G. Lucas, 124 Milam Street, Shreveport, La.

NEW MEXICO Oil Leases for sale, Wholesale. Inquiries invited. Write, Box 507, Las Vegas, New Mexico.

FOR SALE: Selected oil leases, Illinois basin. 8 years to run. L. Livingston, 5057 Enright Ave., St. Louis, Missouri.

New Mexico OIL LEASES WHOLESALE
40 acres at a time.
Roy G. Barton, Clovis, New Mexico.

Leases and Drilling Blocks

INVESTIGATE investments near oil activity—profits or no pay—references, satisfied investors. E. M. Adams, Clarksville, Texas.

FOR
SOUTH GEORGIA
Oil Leases and Royalties
Write
C. W. DEMING, Registered Dealer
Hinson Building, Waycross, Georgia.

FOR SALE: Production, leases and drilling propositions in blocks of 200 to 400 acres, near producing oil wells. W. P. Harley, Bowling Green, Kentucky.

OWNER offers ⅝ interest in well to be drilled on farm where pay sand has been found, in producing area in Ohio. Address Box J-332, The Oil and Gas Journal, 415 Lexington Avenue, New York City.

LEASES, Royalties and drilling blocks throughout present hot play southern Arkansas. El Dorado Oil Exchange, Garrett Hotel Building, El Dorado, Arkansas.

6500 ACRES New Mexico block, fully geologized, with well partially drilled, complete with equipment and casing. Must handle to settle estate. Also 3500 acre drilling block in Huerfano County, Colo. on Alamo Structure near test well now drilling. Also smaller leases on Alamo. C. H. Radford, Box 614, Pueblo, Colo.

Ranches and Farm Lands

400,000 ACRES of ranch Land sold in Southwest Colorado the last three months, is evidence, the producing Stock business is coming back. Write for choice Stock ranches at $2.50 per acre. Land with Gold mines, milk and honey. Wm. M. Haver, 2832 East Elm St., Wichita, Kansas.

VICKSBURG-PORT GIBSON, MISS. DISTRICT. 587 acres fenced, running water, excellent cattle range, two houses, gravel road, GENUINE OIL PROSPECT, $6 acre.

900 acres close in Vicksburg, fenced, (400 woven wire) fine cattle, general purpose, GENUINE OIL PROSPECTS, $11 acre.

2200 acres near Port Gibson, well improved, IDEAL CATTLE — GENERAL FARMING, game plentiful, oil drilling within five miles, $20,000, terms.

BARBOUR REALTY, Vicksburg, Miss.

Situations Wanted

MATERIAL Man, 12 years' field and office experience, catalog pricing. Address Box J-335, The Oil and Gas Journal, Tulsa, Oklahoma.

Situations Wanted

CIVIL Engineer, desires responsible position with oil, or gas Co. Experienced in railway construction, pipe line and lease surveys, also plane table surveys for seismograph crews. Address Box J-291, The Oil and Gas Journal, Tulsa, Okla.

CERTIFIED PUBLIC ACCOUNTANT With over 15 years' experience in public accounting; having a comprehensive knowledge of accounting for the oil industry and qualified to perform the duties of treasurer, secretary, auditor, or chief accountant in a large or small organization, desires to change from present position. Unbroken record of employment. Reasonable compensation. Address Box J-300, The Oil and Gas Journal, Tulsa, Oklahoma.

A-1 Warehouseman and production clerk desires foreign job. Presently employed past 10 years with major oil company. White, 107 N. Moody St., Victoria, Texas.

MECHANICAL ENGINEER, 27, married, desires connection with drilling company. Thoroughly practical; successful roughneck. 18 months' experience on rotary rigs. Familiar with tools and supplies. Address Box J-331, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER. Member of Petroleum Engineering Department well known college free for four summer months. Would like connection any phase of development or production work. Address Box J-330, The Oil and Gas Journal, Tulsa, Oklahoma.

Help Wanted

SALES ENGINEER — Experienced in selling sucker rods and pumping equipment. State qualifications fully. Address Box J-320, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—MUD ENGINEER with chemical knowledge of clays and sales ability to contact oil well drilling field. Write giving qualifications. 603 Law & Finance Building, Pittsburgh, Pa.

CHIEF INSPECTOR for Tube Mills, experienced with oil country goods, boiler tubes, standard pipe, etc. Give complete details, experience, salary required. Address Box J-334, The Oil and Gas Journal, Tulsa, Oklahoma.

Oil Industry Printing

OIL FIELD LEGAL BLANKS
Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

For Sale—Equipment

USED EQUIPMENT

Offered subject to prior sale and to price change without notice.

ROTARY TABLE

Fully reconditioned and guaranteed 20" Model "B" Johnston Gumbo Buster, Make and Break, Plain Bearing Rotary Table with Master Bushings. Not the latest type but a dandy for the money. Price: $700 f.o.b. Wichita. Ph: 2-1431 or LD-59.

ROTARY TONGS

Set of B-J Wilson Type Regular Rotary Tongs complete with 4½" OD and 6⅝" OD heads. Good as new. Price: $250 f.o.b. Corpus Christi Store. Ph: 574 or LD-31.

GATE VALVES

Limited quantity of 4" 8-thd. Oilwell, No. 9 Ludlow, Hughes Type B; 5½" 11½-thd. Kennedy; 6" 8-thd. Walworth and Kelly-Jones; and 8" 8-thd. Wescott Gate Valves. These Valves have been reconditioned where necessary to place them in first class condition. Prices range from $10 to $50 each, depending upon size and type, f.o.b. Wichita. Ph: 2-1431 or LD-59.

WIRE LINE

1" x 2000-feet long, 6x19 Mild Plow, Right Lay, Hemp Center, American Drilling Line. For all practical purposes this line is the same as new. It was used just long enough to require classification as a "used" line. Very substantial discount f.o.b. Tulsa. Ph: 5-3204 or LD-681.

SECTIONAL BAILER

5" x 45-ft., 3-section, used Bailer. Good condition. Price: $90 f.o.b. Kilgore. Ph: 52 or LD-1.

USED BOILERS

(1) 70 h.p., 150-lb. WSP Oilwell; (1) 83 h.p., 200-lb. WSP Acme; and (2) 125 h.p., 250-lb. WSP Lucey Camel Back Type Boilers. All in good condition, complete with stacks, handhole, manhole plates, etc. All offered at money saving prices f.o.b. Corpus Christi. Ph: 574 or LD-31.

CASING COUPLINGS

We can always furnish good used Couplings of all descriptions. Present stocks consist of sizes ranging from 5½" to 20" inclusive. Prices range from $1.25 up. Call our nearest store.

ROTARY DRAW WORKS

Completely overhauled, Unitized, 6" Johnston Gumbo Buster Draw Works, like new. 6-inch Drum Shaft, 5-inch Line Shaft, double cathead on one end of the shaft and a Z-8 Lebus Automatic Cathead on the other end. Every part in first class condition. A real value at $3000 f.o.b. Wichita Falls. Ph: 2-2106 or LD-84.

COUNTERSHAFT CLUTCH

75% off on almost new Type 2-SP, Size 3315 O.C.S. Universal Type Roller Bearing Countershaft Clutch. Two speeds forward and one reverse. Condition guaranteed. Wichita stock. Ph: 2-1431 or LD-59.

ROTARY DRILLING ENGINE

12"x12" Ideal semi-enclosed, plain Bearing, Twin Cylinder, reconditioned Rotary Drilling Engine, equipped with Gumbo Buster Balanced Throttle Valve. An excellent engine at the price. Odessa stock. Ph: 683 or 684.

THE BRIDGEPORT MACHINE COMPANY
Wichita, Kansas, and Branches.

CLASSIFIED DISPLAY RATES

Classified Display is set with a border and may be used in one or two column sizes.

1 Inch	*1 time*	*$5.00*
1 Inch	*13 times*	*4.50 per inch*
1 Inch	*26 times*	*4.00 per inch*
1 Inch	*52 times*	*3.50 per inch*

This space may be contracted for over a period of one year from the date of the first insertion and is PAYABLE IN ADVANCE, MONTHLY.

CLASSIFIED

Classified advertising rates: First insertion, 35 cents a line; each additional insertion, 25 cents a line, PAYABLE IN ADVANCE. Six words usually make a line. Count as a word each one-letter word and each group of figures. White-space computed at regular line rate. Allow two extra lines for blind ads. Ads of less than three lines not accepted. No formal acknowledgement is made, and proofs cannot be shown in advance of publication.

	1 time	2 times	3 times	4 times
3 Lines	*$1.05*	*$1.80*	*$2.55*	*$3.30*
4 Lines	*1.40*	*2.40*	*3.40*	*4.40*
5 Lines	*1.75*	*3.00*	*4.25*	*5.50*
6 Lines	*2.10*	*3.60*	*5.10*	*6.60*
7 Lines	*$2.45*	*$4.20*	*$5.95*	*$7.70*
8 Lines	*2.80*	*4.80*	*6.80*	*8.80*
9 Lines	*3.15*	*5.40*	*7.65*	*9.90*
10 Lines	*3.50*	*6.00*	*8.50*	*11.00*

We reserve the right to withhold all advertising of questionable character. To avoid delay be sure to send remittance with copy. We will set your ad in the smallest amount of space possible and refund all overpayments. One-time insertions will not be run until fully paid. Forms close MONDAY NOON before each issue date.

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

STORAGE TANKS—REFINERY EQUIPMENT

2—10,000 Bbl. Bolted Tanks—Cone Roof—Complete with all Bolts, Gaskets ready for reerecting—$\frac{1}{16}$" side sheets.
2—10,000 Bbl.—All steel—Riveted tanks.
50—55,000 Bbl. All steel, 5 ring Storage Tanks.
128—80,000 Bbl. All Steel, Latest Type Storage Tanks.
These tanks offered F.O.B. cars or reerected on grade furnished by customer.

SONKEN-GALAMBA SUPPLY COMPANY

W. C. Berry or H. J. Galamba
Riverview at Second,
Kansas City, Kan.

J. O. Isaacks
Hays, Kansas

Robt. W. Duden
2100 S. Union,
Tulsa, Okla.

25 K.W. and 40 K.W. Gas Engines, 220 volts, D.C. Two 100 K.W. Gas Engine-Generator Sets, 220 volts, D.C. 7x6 Ingersoll-Rand ER-1 Air compressor, Six-inch Oster Pipe Threading Machine. Also large stock of lathes, pipe machines, milling machines, etc. Send for our list.
Terms to suit.
CINCINNATI MACHINERY & SUPPLY CO.
26 West 2nd St. Cincinnati, Ohio

PIPE LINE CONSTRUCTION EQUIPMENT FOR SALE

1 RD8 Caterpillar LaTourneau Angle Dozer.
1 RD7 Caterpillar All Steel Boom Tractor.
2 RD6 Caterpillar All Steel Boom Tractors.
1 RD4 Caterpillar All Steel Backfiller Tractor.
1 Model D Buckeye Back Filler.
2 Model 48 Buckeye Ditchers.
1 ¾-yd. General Excavator Pull Shovel.
8 250-gal. Standard Steel Paint Pots.

Pumps, winches, pipe cleaning machines, heating torches, lowering-in tripods, and numerous parts and small tools.
The tractors and ditchers bought new and only used 4 months.
Address:
E. H. Reeder Construction Co.
6017 Swiss Ave., Phone 3-2383
Dallas, Texas.

FOR SALE: One 32 Model Sparta Spudder, one Model L Star Spudder, both complete with tools. D. L. Williams, 723 S. Broadview, Wichita, Kansas.

FOR SALE
Star Drilling Machine No. 22, mounted with 4 cylinder gasoline engine. Will drill 1200 ft. Full string of tools, 40' mast in A No. 1 shape. Outfit ready to drill. Address Box J-322, The Oil and Gas Journal, Tulsa, Oklahoma.

TRACTORS
Government crawler type Caterpillars 5 ton $375, 10 ton $695. Slightly used. Perfect condition.
O. C. EVANS
Mt. Sterling, Ky.

WELDER DEMONSTRATORS. Used and new. Electric or Gasoline engine drive. Thoroughly guaranteed. 30 Days' Trial. Terms if desired. Hobart Welder Exchange, Box OG-2 Troy, Ohio.

FOR SALE
25,000 feet 8" 37 lb. plain end Gas Line 57c per foot, Chicago, Ill.
25,000 feet 6" plain end used line 38c per foot, Franklin, Penna.
30,000 feet 6" threaded and coupled line, 42c per foot, Franklin, Pa.
L. B. FOSTER CO., INC.
P. O. Box 1647, Pittsburgh, Pa.

1—30-ton Whitcomb 0-4-0 gasoline loco. run only 2000 miles, 1st class cond.
1—301 Koehring Gas. Cat. Crane, 1-yd. bucket.
30—10,000-gal. used tank car Tanks, coiled.
IRON & STEEL PRODUCTS, INC.
Chicago (Hegewisch Sta.) Ill.

FOR SALE: At our Oklahoma City garage, "75" Allis-Chalmers crawler type tractor with M-75 front end Braden winch mounted thereon. Used for servicing Oklahoma City wells. $1,500.00. I. T. I. O., Bartlesville. Oklahoma.

DRILLING RIGS, drill pipe, boilers and any kind of used rotary drilling equipment immediate delivery. Write, wire or phone M. ROSENBLOOM PIPE & SUPPLY CO., 3538 Mansfield Road, Shreveport, La.

FOR SALE—Two Rotary Drilling Rigs in West Texas and New Mexico. Herschbach Drilling Company, Dallas and Kermit, Texas.

Equipment Wanted

WANTED 80 to 200 gallon used re-refining plant for crankcase oil. P. O. Box 155, Rockport, Indiana.

WANT direct connected Gas (not gasoline) Engine driven Gas Compressor. Three million cu. ft. per 24 hours. 100 pounds intake, 450 pounds discharge pressure. First class condition. The J. C. McClintock Company, El Paso, Texas.

Survey Service

THE DOWSING METHOD for locating oil structures, faults, and treacherous areas, operates on the principal of vibratory response to emanations from petroliferous sub-strata. Our WATSON No. 2, pioneer well of the Wilmington, Calif., field was located by this method and all my personally owned production. 15 years experience. This physico method may solve all your structural difficulties. Geo. Miller, 1548 Post Ave., Torrance, Calif. Ph. 983.

Business Opportunities

SMALL refinery, only one in county, ideal location, six trucks serving 40 stations. Large warehouse, storage, at invoice. Account of health. S. L. West, Shawnee, Oklahoma.

WANTED reliable contractor to drill McClosky well in Illinois Basin on seismograph structure. One capable of taking substantial interest in well. Give best price and amount of interest you will carry. Address Box J-333, The Oil and Gas Journal, Tulsa, Oklahoma.

Mailing Lists

COVERING every branch of oil industry. Write your needs. Oil Industry Mailing List Co., 909 Tulsa Loan Bldg., Tulsa, Oklahoma.

Financing

CAPITAL SEEKERS—Put your project before 260 Key-Men. Cost trifling. Details free. AMSTER LEONARD, Fox Theater Building, Detroit, Michigan.

INQUIRIES solicited from corporations interested in raising capital through marketing of corporate securities.
THE BROOKWORTH CO., Inc.,
110 East 42nd St., New York City.

JOHN MORRIS, Box 5411, Philadelphia writer of some of America's greatest financial campaigns will shape your deal FREE. Prospectus expertly written and list supplied for $25, and low commission. Handle your own mailing. Established 1913.

Welding Service

ATTENTION
International Petroleum Expo.
Exhibitors
"There Is a Difference In Welding"
Portable Welding Service
C. C. FORRESTER
Telephone 4-9498
116 So. Elgin Tulsa, Okla.

Crude Oil Production

RODESSA CRUDE OIL, 43 gravity, paraffin base for sale from my own and other Miller County, Arkansas, wells delivered on Tankers at Good Hope (New Orleans), La. See my representative, O. E. Hodge Carondelet Building, New Orleans. William Monroe Layton, Rodessa, Louisiana.

Incorporations

DELAWARE CHARTERS: Complete service $35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

CHARTERS — Delaware best, quickest, cheapest, more liberal. Free forms. Colonial Charter Co., Wilmington, Del.

Royalties Royalties

OIL ROYALTY INVESTMENTS

Oil is one of the greatest of all natural resources. It is the most important of any commodity in use today, except food. The wheels of industry would cease to turn without the lubrication and power derived from "crude oil." For this reason, it is well to own an interest in such an all-important product.

A royalty interest represents the actual ownership of a percentage of the oil underlying the tract where it is purchased. This is known as "Landowner's Royalty."

The oil is produced and marketed by the operating company without expense or cost to the royalty owner, and the pipe line company issues checks monthly for oil produced the previous month.

Landowner's Royalty, when scientifically selected and equitably priced, represents an investment from which the investor may expect the return of capital invested and enjoy a fair profit.

The average investor usually is not sufficiently experienced to scientifically select or to judge if a royalty is equitably priced. *This is the service rendered you by your Registered Retail Dealer.* These dealers furnish you with an accurate, detailed offering sheet which has been filed with the Securities and Exchange Commission, in Washington, D. C., on all of their offerings, and will be glad to answer any question pertaining to the offering sheet.

The names and addresses of Registered Dealers in your vicinity will be mailed to you upon request.

"Honesty and Service Our Motto"

GRIMES ROYALTY CO.

Hunt Building
TULSA, OKLAHOMA

Royalties

ANDREW J. BARRETT
The Philtower
Tulsa, Oklahoma.

Brokers—Salesmen

Sell in the most active area in the United States—The Permian Basin of West Texas and Southeastern New Mexico. From the standpoint of royalty investors this area has much to offer. Can supply you with choice non-producing royalties located on geophysical highs. Also drilling blocks, close in acreage to production, or wildcat leases. I maintain my own field men who cover this area for me. All offerings meet the requirements of the Security and Exchange Commission. Inquiries invited.

B. D. BUCKLEY

Paul Brown Bldg., St. Louis, Mo.

Producing and Non-Producing
OIL ROYALTIES
Registered Dealers Only
GRIMES ROYALTY CO.
Hunt Bldg. Tulsa, Okla.

PRODUCING OIL ROYALTIES
15 years of experience.
L. H. WITWER
214 Kennedy Bldg., Tulsa, Okla.

NEW MEXICO Oil and Gas Leases and royalties. Send 50 cents in stamps for new State Oil Map of New Mexico. Roy G. Barton, Clovis, New Mexico.

Oil Royalties and Oil and Gas Leases Bought and Sold
E. T. Marion
1109 Petroleum Building
Midland, Texas

ATTENTION
Let us help you sell your lease or royalty. Oil Property Advertising Sales Co., Box 2603. Tulsa, Oklahoma.

Notice of Sale

NOTICE OF SALE

In the matter of TRINITY REFINING COMPANY, Debtor, No. 1939, in the UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF TEXAS, Fort Worth Division, Fort Worth, Texas.

Hon. Glenn Smith, Referee in Bankruptcy, has ordered the Trustee to sell the following assets of said Trinity Refining Company:

a. A tract of 4.3 acres of land out of the Martha Dillard Survey, Gregg County, Texas.
b. A refining plant located on land described in "a."
c. One 55,000 barrel steel storage tank located on the J. E. Turner land, approximately 1500 feet north of refining site.
d. A certain ground lease out of the Martha Dillard Survey in Gregg County, consisting of 23,700 square feet of land, together with the office building that is located thereon.
e. Office furniture and fixtures, accounts receivable and other miscellaneous personal property.
f. Loading rack on right-of-way of the Texas & Pacific Railway, and pipe lines from refinery to loading rack.
g. The interest of Trinity Refining Company in 144,083.32 barrels of oil delivered to Gilliland Refining Company.

The above is offered free and clear of all claims, liens and encumbrances.

The Trustee will receive proposals for the purchase of any or all of the above described property in writing. Such offers may be sent to him at 1308 Fort Worth National Bank Building, Fort Worth, Texas, up to and including the date of April 4, 1938. Bids must be accompanied by Cashier's Check for a sum equal to at least 10% of the amount of the proposal.

A Hearing and report on the matter will be had before the Referee in Bankruptcy at 10:00 A.M., April 8, 1938.

Correspondence is invited from anyone interested in inspecting the property and in submitting bids.

DAVID DONOGHUE, Trustee.

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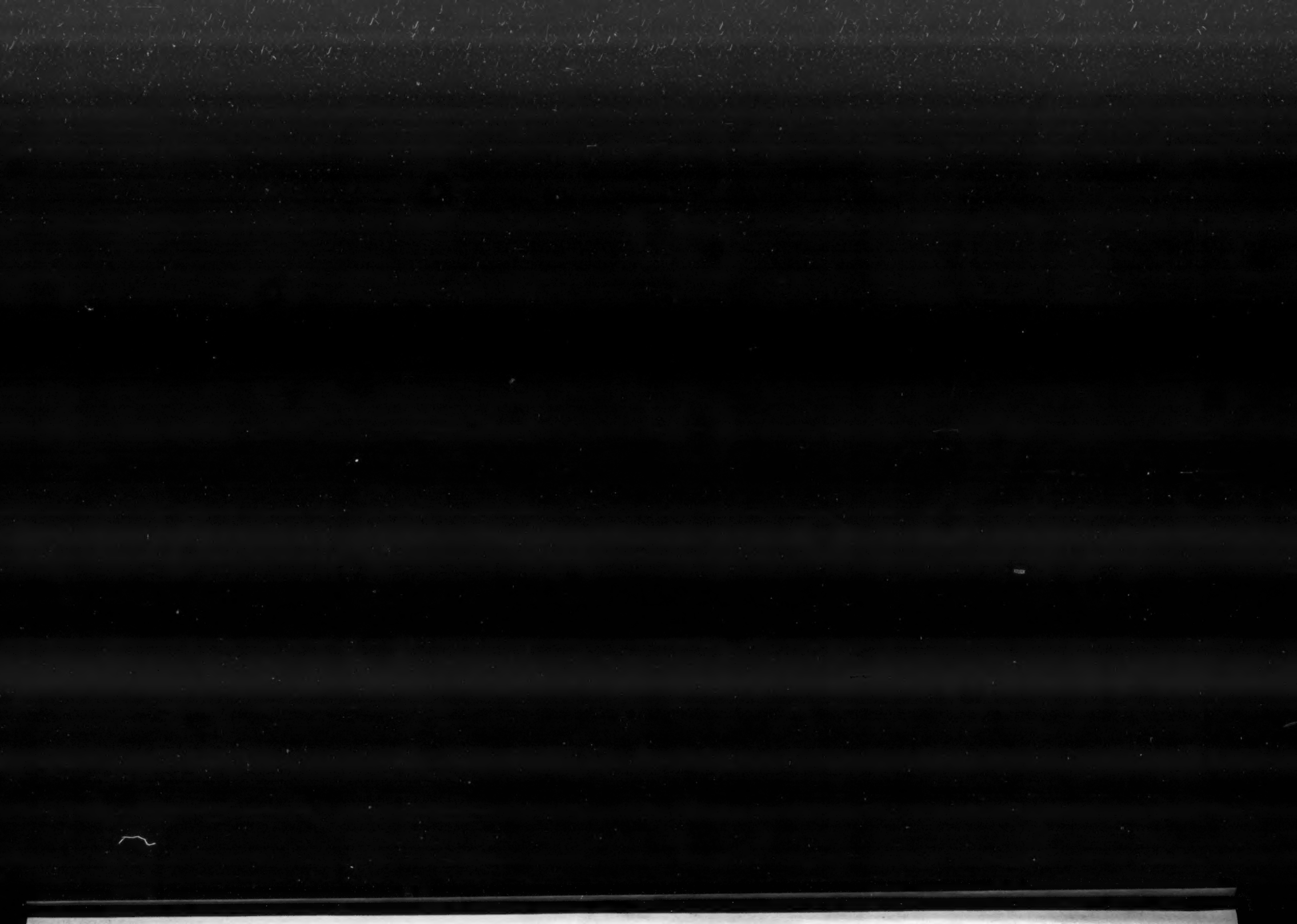
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